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THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

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PART XXIX.

*With a Coloured Plate.*

*(Continued from page 906 of Volume XXVI.)*

Genus—GALLOPERDIX.

GALLOPERDIX SPADICEA SPADICEA.

*The Red Spur-Fowl.*

The genus *Galloperdix* contains a group of small game-birds entirely confined to India and Ceylon. In general appearance they are half-way between the Jungle-Fowl and the Partridges; they have the general carriage of small hens, but their tails, though much longer than those of the Partridges, are carried in the same manner, and not erect as in the true Jungle-Fowl.

The moult of the tail feathers is not as yet known, so for the present I propose to retain these birds amongst the *Perdicinae* or Partridges, though in many ways they show a close affinity to the *Phasianinae*.

The wing is short and rounded, the first primary the shortest, and the fifth or sixth longest or equal. The tail consists of fourteen feathers, slightly graduated, and about two-thirds, or rather more, the length of the wing. The tarsus is long and stoutly built, and has two, three, and rarely even four spurs, the numbers on the two legs often being unequal. Even the female usually has a spur on either leg, and often two on one or both of them.

There is no wattle or comb as in the Jungle-fowl, but there is a naked space round the eye of a dull brick-red colour, which becomes markedly brighter in the breeding season.



There are three known species of this genus, and it is further necessary to sub-divide one of them, *G. spadicea*, into three races which are easily distinguished from one another and of which each occupies a well-defined area.

I adopt Blanford's key as it stands, as no better can be made.

*Key to Species.*

- A. Two or three spurs on each tarsus.
  - a. Breast chiefly chestnut or rufous ... *G. spadicea* ♂
  - b. Breast buff with black spots ... *G. lunulata* ♂
  - c. Breast chiefly white ... *G. bicalcarata* ♂
- B. Rarely more than one spur on one leg and two on the other.
  - d. Breast chestnut with black tips to feathers *G. spadicea* ♀
  - e. Breast ochreous brown ... *G. lunulata* ♀
  - f. Breast chestnut without black tips to feathers ... *G. bicalcarata* ♀

GALLOPERDIX SPADICEA.

*Key to Sub-Species.*

- A. General colour chestnut, crown brown ... *G. s. spadicea* ♂
- B. General colour very bright chestnut, crown blackish ... *G. s. stewarti* ♂
- C. General colour greyish chestnut paler everywhere ... *G. s. caurina* ♂
- D. Above grey with only faint rufous tinge ... *G. s. spadicea* ♀
- E. Above rufescent grey and darker generally. *G. s. stewarti* ♀
- F. Very pale with no rufous tinge ... *G. s. caurina* ♀

The Red Spur-Fowl was originally described from Madagascar into which island it had apparently been introduced from India. Gray (Ill. Ind. Orn. II., pl. 42) describes the bird as being the "Kokee-tree of the Mahrattas". His *Polyplectron northiae* is described from a female, but no locality is given, and, finally, Blyth's *Galloperdix spadiceus* is described as coming from Central and South India. We may therefore fix the type locality as Ootacamund in the Nilghiri Hills of South Central India.

GALLOPERDIX SPADICEA SPADICEA.

*The Red Spur-Fowl.*

La Perdix rouge de Madagascar,—Sonnerat, Voy. Ind. Orient. ii., p. 169 (1782).

Brown African Partridge,—Lath, Gen. Syn. pt. ii., p. 759 (1788) (Madagascar.)

*Tetrao spadiceus*,—Gmel. Syst. Nat. 1, pt. ii., p. 759 (1788) (Madagascar)

*Perdix spadicea*,—Bonnat. Tabl. Encycl. Meth. 1, p. 208 (1791) (Madagascar); Temm., Pig. et Gall. iii., p. 315, 719 (1815) (Madagascar), Less.; Traite 'd' Orn., p. 504 (1831) (Senegal); Gray, in Griffith's ed. Cuv. iii., p. 47 (1829) (Madagascar).



*Francolinus spadiceus*,—Gray, III. Ind. Orn. ii., pl. 42, fig. 2 (1834).

*Polyplectron northiæ*,—Gray, III. Ind. Orn. ii., pl. 43, fig. 1 (1834) (female).

*Ithaginis northiæ*,—Gray, List of Birds pt. iii., Gall. p. 32 (1844).

*Ithaginis madagascariensis*,—Gray, (nec. *Tetrao madagarensis*, Scop.) List of B. pt. iii., Gall. p. 32 (1844); id. Gen. B. iii. p. 504 (1846).

*Galloperdix spadiceus*,—Mc. Master, J. A. S. B. xl., pt. 2, p. 215 (1845); Blyth, Cat. Mus. As. Soc., p. 241 (1849) (C. and S. India); Gould, Birds Asia, vi., pl. 68 (1854); Jerdon, Birds of India, iii., p. 541 (1863); Hume, Nests and Eggs, Ind. B., p. 532 (1873); Fairb., Str. Feath. v., p. 409 (1877) (Palani Hills); Ball., Str. Feath. v., p. 418 (1877) (Mahanadi and Godaveri Rivers); Marshall, Birds' Nests Ind., p. 59 (1877); Hume & Marshall Game B. Ind. 1, p. 247, pl. (1878); Davidson and Wendon, Str., Feath. vii., p. 87 (1878) (Deccan); Ball, Str. Feath. vii., p. 225 (1878) (Ganges to Godaveri); Vidal, Str. Feath. ix., p. 76 (1880) (S. Konkan); Butler, Str. Feath. ix., p. 422 (1880) (Deccan and S. Mahratta Country); Davidson, Str. Feath. x., p. 316 (1882) (W. Khandeish); Davison, Str. Feath. x., p. 410 (1883) (Nilghiris, Wynaad and Mysore); Swinhoe and Barnes, Ibis, 1885, p. 131 (Central India); Taylor, Str. Feath. x., p. 1164 (Manzurabar, Mysore) p. 531 (1887) (Orissa); Terry, Str. Feath. x., p. 479 (1887) (Palani Hills); Barnes, Birds Bombay, p. 305 (1885); Oates, ed. Hume's Nests and eggs iii., p. 423 (1890); Davidson, J. B. N. H. Soc. vi., p. 340 (1891) (Kanara); Sharpe, J. ibid. ix., p. 487 (1895); (Coonoor); Davidson, ibid. xii., p. 63 (1898) (Kanara); Dewar, ibid. xvi., p. 495 (1905) (Madras).

*Hepburnia spadicea*,—Hartl., Orn. Beits. Madag. p. 68 (1861) (Madagascar).

*Ithaginis spadiceus*,—Gray, List. Gall. Brit. Mus., p. 47 (1867).

*Galloperdix spadicea*,—Blyth, Ibis, 1867, p. 157 (Oudh, Gorakhpur); Elwes, Ibis, 1870, p. 528 (Cardamum Hills); Blanford, Journ. A. S. Bengal xxxviii., pt. ii., p. 189; Ogilvie-Grant, Cat. Birds B. M. xxii., p. 261 (1893); id., Man. Game B. 1, p. 206 (1895); Blanford, Faun. Brit. Ind. iv., p. 106 (1898); Oates, Mon. Game Birds Ind. 1, p. 215 (1898).

*Hepburnia spadiceus*,—Ball, Str. Feath. ii., p. 426 (1874) (Chota Nagpur), iii., p. 294 (1875).

*Galloperdix spadicea*,—Oates, Cat. Birds Eggs Brit. Mus. 1, p. 49, pl. iv., fig. 4 (1901) (Egg).

**VERNACULAR NAMES.**—Chota Jungli Murghi (*Hin. Cent. Provinces, &c.*); Chakotri, Kokatri (*Mahr. Syhadri Range*); Kustoor (*Mahr. Deccan*); Sarawa-Koli (*Tamil*); Yerra-Kodi, Jita-Kodi (*Tel.*)

**Description**—*Adult Male*.—Crown and nape dark brown shading into pale brown on the hind neck and into sandy brown or buff on the forehead. Upper back, scapulars and inter-scapulars rufous chestnut, each feather margined with pale greyish-brown; lower back, rump and upper tail-coverts chestnut, finely vermiculated with broken bars of black; visible portions of tail the same, but the inner webs blackish on all but the central pair of rectrices and almost entirely black on the outermost.

Median and greater wing-coverts like the lower back, and lesser wing-coverts like the upper back; quills dark brown, the outer secondaries with chestnut buff mottling on the outer webs, and inner secondaries like the lower back; under aspect of wing lighter brown.

Below, chin whitish-brown, grading into silvery brown on the cheeks, ear-coverts, and sides of the throat; breast, flanks and



abdomen above vent chestnut, each feather margined with pale chestnut buff; thighs, vent and posterior flanks dull brown; under tail-coverts brown, or chestnut brown, vermiculated with black.

The sparse feathers on the naked part round the eye are dark brown, but hardly show except in a fine line under the lower eyelid.

Individuals, both of typical specimens of *spadicea* and of its two races, have a few of the feathers of the breast with grey centres, which, as Ogilvie-Grant has pointed out, appear to be indicative neither of age, locality nor season.

*Colours of Soft Parts.*—Iris yellow, yellowish brown or dull hazel brown; naked skin round the eye brick-red, dull and often somewhat livid in the non-breeding season, but brighter and redder in the breeding season; bill horny-brown, reddish at the base and paler on the lower mandible; legs generally reddish brick, often reddish-brown, sometimes almost reddish-yellow or, very rarely, with a faint greenish tinge; spurs dull horny brown.

*Measurements.*—Wing from 145 to 166 mm., average 32 specimens, 156.1 mm.; tail from 123 to 147 mm., average 137.5 mm.; tarsus from 48 to 52 mm.; bill from front about 20 mm., from gape rather over 25 mm.

*Adult Female.*—Forehead sandy brown, changing to brown and blackish-brown on crown and nape; neck dark brown. Back, scapulars and wing-coverts grey or sandy, rarely with a faint rufous tinge, each feather with two bold bars of black; rump and upper tail-coverts the same, but with less black and, generally, a more rufous tinge; tail blackish, the central feathers with mottled bars of buff or rufous, decreasing in extent until they only form a mottled edging to the outermost.

Chin and throat almost white, changing to dirty pale brown on foreneck; breast and flanks rather pale chestnut rufous, each feather with a terminal band of black, lessening in extent towards the vent; the posterior flanks often mottled with black in addition to the bars; vent and under tail-covert dull brown, the latter mottled with black and rufous or sandy.

The extent of the black on the lower parts varies considerably, in some the extreme upper breast and anterior flanks being very heavily barred. Wing-coverts and innermost secondaries like the back; primaries and outer secondaries amber brown.

*Colours of Soft Parts.*—As in the male, but the bare skin round the eye is duller and less clear a red, and the legs never become so red as they do in some breeding males and often are more brown or even greenish-brown.

*Measurements.*—Wing from 134 to 163 mm., average of 24 specimens 150.1 mm.; tail from 118 to 146 mm., average 129.1 mm.; tarsus 45 to 49 mm.; bill from front about 20 mm., and



from gape about 24 mm. Nearly all females have some signs of spurs, many have a well developed spur on one or both legs, and a few have two spurs on one leg and one on the other, and occasionally have two on both legs.

*The Young Male* is like the female, but is more richly and deeply coloured, with more black in proportion to the buff and rufous.

*The Young Male in first plumage* is like the female, but more dark and rich in general tint, and the tail is deep chestnut with definite bars of black.

*Distribution.*—The Red Spur-Fowl is found over a very wide area, although it is rather scattered in its distribution. It is found in the Terai below the Central Himalayas in Western Nepal to Goruckpur; it is common in practically all the well-wooded hill ranges throughout Central India from Saugor to Rajmahal and Nya Dumkah, though it appears to have now practically disappeared from the latter district. South of this it is found in suitable localities in Central India, Orissa and Madras wherever there are broken hills well covered with forests or bamboo jungle. Birds from Mysore and North-East Coimbatore are of the typical race, and this extends at least as far South-East as the Palni Hills, latitude  $10^{\circ}$ .

In South-East Bengal it is undoubtedly becoming more rare. In 1883 when stationed in the Santhal Parganas it formed a not very rare item in our miscellaneous bags, but I hear that now it is never seen; in Madras, however, where it is to some extent preserved, it appears to be steadily increasing in numbers, and it is very common on all the Hill Ranges from the foot hills to 4,000 feet or more.

It extends into the Bombay Presidency South of Rajputana and the Mahableshwar birds referred to by Blanford are far nearer true *spadicea* than to *caurina*.

On the Malabar Coast North of Travancore specimens appear to assume a somewhat richer colour, and three specimens procured there by Chapman and now in the British Museum series are about half-way in depth of colouring between *spadicea* and *stewarti*, but have not the bright tint of the latter bird, so for the present I retain them under the typical name.

*Nidification.*—The breeding season of the Red Spur-Fowl varies very greatly in different portions of its habitat, and even in single areas is somewhat erratic. In the South and Central portion of its habitat its eggs may be taken any time from February to June, March being, perhaps the month in which most are found. It has generally been credited with having a second brood in September to November, but I can trace no grounds for this, and such an occurrence must be quite exceptional.

It breeds from the foot hills at all heights up to 5,000 feet, and sometimes in the Southern Hill Ranges up to 6,000 feet or more.



Most birds, however, will be found breeding in these hills between 2,000 and 4,000 feet. They make no real nest, but lay their eggs in some small hollow, either scratched out by themselves or a natural one, not infrequently they are laid on the flat ground, and are only kept together by the fallen leaves and rubbish under and around them. The majority of nests will be found in fairly thick scrub jungle, forest or bamboo jungle, and the latter, especially where there is plentiful undergrowth, is a favourite breeding haunt over much of its area. It does not appear necessary for the jungle to be very extensive, and in Chota Nagpore it was sometimes found breeding in quite small patches of *Sal* and scrub surrounded with small fields of cultivation.

The number of eggs laid is 2 to 5, and undoubtedly the normal full clutch is 3. I have never seen more than 4 myself, one taken by Mr. Vidal and one taken by Mr. J. Davidson in Kanara. The latter, who took very many nests of this Spur-Fowl in Kanara and Nasik, never found more than 4 in a clutch, and that number only two or three times in some 50 or 60 clutches. On the other hand two eggs only are often found incubated.

The stories of the large number of eggs laid seem to be founded only on native reports; Miss Cockburn, who made many of her notes on such authority, says that they lay from 6 to 10 eggs, but she writes of the Nilgiris where everyone else has found only 2, 3, or rarely 4 eggs in a clutch except Davison, who says he has rarely found more than 5. Hume *thinks* it lays from 4 to 7 eggs, but apparently he too writes on rumours chiefly, though it must be noted that Darling records one nest of 7 eggs and two of 5.

The eggs are miniature fowls eggs, on the whole rather narrower in proportion to their length, and perhaps slightly more pointed. The shell is very stout, and the texture fine and close, and the surface smooth and often with a slight gloss.

Hume gives the average of 25 eggs as  $46.6 \times 34.0$  mm. 36 measured by myself have averaged much smaller, *i. e.*,  $38.9 \times 29.2$  mm., whilst the average of Hume's eggs now in the British Museum is  $42.8 \times 31.8$  mm. The largest egg both in length and breadth I have been able to measure is  $46.9 \times 36.3$  mm., and the smallest in both length and breadth is  $37.7 \times 28.1$  mm.

It is probable that these birds pair for life; the cock is certainly monogamous and keeps close to the hen whilst she is sitting and helps her to rear and look after the chicks when hatched. The hen is a very close sitter, and Hume writes that he has twice known one to be caught by natives on the nests.

*General Habits.*—The Red Spur-Fowl is found from practically the level of the Sea up to 5,000 feet, wandering above this up to 6,000 feet, and even 7,500 feet, but it does not appear to be found anywhere in the true plains; it is essential that there should be



ample cover and that it should be in broken hilly country. As regards the kind of cover it frequents, this does not really seem to matter much. It is sometimes found in thick evergreen forest, but more often in thick scrub, in bamboo jungle and the dense undergrowth of Sal and other deciduous forest. At other times it may haunt well wooded nullas and ravines of scattered patches of Jungle in more or less open or cultivated ground.

It is not a gregarious bird, and when found in small parties up to some half dozen or so, these consist only of the two old birds with their last brood, and before the breeding season commences the latter disperse to take up their own domestic responsibilities.

I have never heard of the Spur-Fowl being especially made the object of a day's sport ; the few one gets are nearly always part of a mixed bag made when one is shooting game driven by a line of beaters. Under these circumstances one never seems to get many, even where they are most common, for they are such confirmed runners and skulkers that they are most difficult to flush, and prefer to race across from one patch of Jungle to another rather than trust to their wings. They are splendid runners, and dodge from one bush to another at such a pace that it is really just as sporting to treat them like rabbits on the ground rather than wait for the chance of their flying when they offer a very easy shot. If forced to fly they get up with a great fluster and flapping of wings, but their speed is by no means commensurate with the noise, consisting of a few flaps and beats, then a sail of a few yards, another few beats, and a headlong dive into cover. When rising, they always utter a chuckling noise which reminds one much of an old barnyard hen which has been frightened, but they cannot emit nearly such heart-rending cries as the latter bird. The crow of the cocks in the breeding season is much the same kind of call, and the conversational notes of a separated family are merely subdued and modified versions of the same.

In the mornings and evenings they frequently come out into the open to feed, especially where small patches of cultivation intersect their forests and jungles. In the Hazaribagh and Ranchi districts we often found them quite in the open feeding on the fallen berries of the Bér bushes scattered about on the broken hill sides and more than once we turned them out of millet and ripe rice in the very early mornings in the cold weather.

They feed on both an insect and vegetable diet, and as Hume records " their food consists chiefly of grain and seeds of all kinds, and small jungle fruit, the berries of the dwarf *Zizphus* (*Jher bery*), the figs of the *Peepul* and its congeners, but I have often found the remains of bugs, beetles, and other insects in their



crops mixed with these." I have also found their crops full of a millet (Bajra) and of paddy.

They are very good eating and are better and more gamy than most of our Indian partridges. No finer way of cooking them can be found than rolling them up in a ball of clay and roasting them in the ashes of a good strong fire. They should be rolled up, feathers, entrails and all, and then when the burnt clay is broken open the feathers and skin will come away with the clay, and a most juicy morsel remain to be eaten.

#### GALLOPERDIX SPADICEA STEWARTI.

##### Stewart's Red Spur-Fowl.

*Galloperdix spadiceus*.—Blyth, Cat. Mus. As. Soc., p. 241 (1849) (part); Davison, Str. Feath. x., p. 410 (1883) (part); Bourdillon, J. B. N. H. Soc. xvi., p. 4. (1904) (Travancore).

*Galloperdix spadicea*.—Ogilvie-Grant, Cat. B. M. xxii. p. 261 (1893) (part); id, Man. Game-B. i., p. 206 (1895) (part); Blanford, Avi. Brit. In. iv., p. 106 (1898) (part); Oates, Man. Game-B. In. i., p. 215 (1898) (part).

*Galloperdix spadicea stewarti*.—Stuart Baker, Bull. B. O. C. xl., p. 18 (1919). (Aneichardi Travancore).

**VERNACULAR NAMES.**—Saravoo Koli (*Tamil, Travancore*).

**Description**—*Adult Male*.—Similar to *G. s. spadicea*, but very much more richly coloured; the crown is practically black, and the whole of the upper parts are a bright chestnut rufous, the pale borders to the feathers being absent or obsolete, the vermiculations on the lower back entirely absent and on rump and upper tail-coverts almost so. Below the colour is equally intensified and rich, and the chestnut colour extends right back behind the vent and on to the posterior flanks.

The type male has some grey spots on the breast, but this is probably only an individual characteristic, as two males obtained by Surgeon-Major Fry at Trevandrum have no such spots. It should, however, be noted that whereas these spots in typical *spadicea* are more or less circular in this bird they are heartshaped, and they are also bordered with black, a feature only seen, and that very faintly, in one other specimen of true *spadicea* from Ootacamund.

**Colours of Soft Parts** as in *G. s. spadicea*.

**Measurements.**—Wing, 145 to 161 mm., average 10 specimens, 154.5 mm.; tail, 123 mm. to 140 mm., average 129.6 mm.; tarsus, about 50 mm.

**Adult Female.**—Differs from the adult female of *spadicea* in the same way as the male differs from the male of that bird. The colour generally is very rich and very strongly suffused with rufous both above and below, and altogether it is a brighter, much handsomer bird than is the typical form.



The extent of the black markings varies to the same degree as in that bird, but they are generally bolder, and in one bird the smaller vermiculations are entirely wanting on the upper surface, the black being restricted to bold bars.

*Colours of Soft Parts* as in *G. s. spadicea*.

*Measurements*.—Wing, 148-150 mm. (4 specimens); tail, 125-129 mm.; tarsus, about 48 mm.; spurs, from one on each leg to two on each leg, up to 15 mm. long.

*The Young Male* differs from the young male of typical *spadicea* in being much more richly coloured. The upper parts are rufous with the black bars reduced to striae, whilst the breast and lower parts are bright chestnut brick-red with the black markings showing merely as black shaft lines on the extreme upper breast and foreneck, and as obsolete bars elsewhere.

*Distribution*.—Travancore only, between the foot hills and 3,500 feet.

*Nidification*.—The Travancore Spur-Fowl breeds during February and March, and it is during these two months only that Mr. Stewart obtained all his eggs. The nest-hole is always scraped in dense cover, and most often in some almost impenetrable cane brake in evergreen forest. Less often it is placed under a bush or a mass of creepers, and it may also occasionally be found in thick bamboo jungle. Like *G. spadicea* it makes no nest, the only materials used being the fallen leaves and rubbish accumulated on the ground.

The eggs number 2 or 3 only, and whilst Mr. Stewart has never seen or heard of more than 3, he has often taken 2 well incubated.

The eggs are, of course, quite inseparable from those of *G. s. spadicea*.

The average of 24 eggs is almost exactly  $40 \times 30$  mm. The largest I have measured in length and breadth was  $41.7 \times 31.1$  mm., and the smallest in length and breadth were  $39.1 \times 30.2$  mm. and  $40.7 \times 28.3$  mm. respectively.

The cock is monogamous, and Mr. Stewart thinks they probably pair for life, and as with the common Red Spur-Fowl, the cock bird proves an excellent father and husband.

They seem to breed only in the area of heaviest rainfall, to which fact is due their brilliant and dark colouration. The average rainfall is about 150 inches or more annually, an amount greatly in excess of that falling over the greater part of the range of the typical bird.

*General Habits*.—This Spur-Fowl is very common in Travancore on the Shinkotta Hills between 1,000 and 3,000 feet, being more common at elevations half-way between these two extremes, and sometimes being found still lower than 1,000 feet. They are



essentially birds of thick cover, and will never be found on the open bare lands so common in parts of Travancore, nor indeed will they often be found in scrub or thick grass, though they frequent the dense patches of Lantana bush in the mornings and evenings, greedily eating the berries and the white ants—or termites—which are as plentiful as the berries.

Their home is in the depths of evergreen Jungle, and less often in heavy bamboo jungle, and here, as one wanders gun in hand, they may often be heard rustling about amongst the fallen leaves, a habit which has bestowed upon them the Tamil name of Saravoo Koli or Dry-leaves Fowl.

Less often than they are heard they may be seen scuttling across some more open glade or forest path, and a hasty snap shot obtains a dinner worthy of an epicure. If put up by dogs, they invariably take to trees, and if so treed it is then easy to pot them as they sit. They are poor flyers, though like many others who are poor performers, they are very noisy, making a great fluster in rising, and a loud whirr as they fly.

Mr. J. Stewart, to whom I owe the foregoing notes, says that he has never attempted to make a bag of Spur-Fowl; but has several times got 4 or 5 in a morning's or evening's walk. They were most often met with when one was after big game, and in consequence escaped without being fired at.

When disturbed, they utter a chattering cry, and after a pair or a family have been put up and separated, they continue to call to one another until all have been reunited.

The cocks are not noisy birds, but crow, if one can call their chuckling cry a crow, regularly in the mornings and evenings during the breeding season. One would have expected birds so well armed with weapons of offence to be exceptionally combative, but I can find no support for such an idea, and Mr. Stewart informs me that he has never come across them fighting or obtained any evidence, native or otherwise, to make him think they are at all pugilistic by nature.

They are difficult birds to rear, and Mr. Stewart never succeeded in bringing them up. His most successful attempt was with some birds which grew half-way to maturity, and then all died after their first meal of paddy, a food substituted too suddenly for their previous diet of white ants.

They have, however, been reared in the Trevandrum Zoological Gardens, where they lived in amity with some Grey Jungle-Fowl.

They feed on a mixed diet of insects, fruit and grain, and in the mornings and evenings are very fond of scratching about and feeding in the intensely thick secondary growth which so soon covers the deserted coffee clearings. They do not, however, ever haunt the more open coffee which is being cultivated.



## GALLOPERDIX SPADICEA CAURINA.

*The Aravalli Spur-Fowl.*

*Galloperdix spadicea* var *caurina*,—Blanford, *Avi. Brit. In.* iv., p. 107 (1898).

*Fringilla spadiceus*,—Gray, *Ill. Ind. Orn.* ii., pl. 42, fig. 2 (1834) (part).

*Polyplectron northiae*,—Gray, *Ill. Ind. Orn.* ii., pl. 43, fig. 1 (1834) (part).

*Ithaginis northiae*,—Gray, *List of B.*, pt. iii., Gall. p. 32 (1844) (part).

*Galloperdix spadiceus*,—Blyth, *Cat. Mus. As. Soc.*, p. 241 (1849) (part); Butler, *Str. Feath.* iv., p. 5 (1876) (Aboo and N. Guzerat); Fairbank, *ibid.*, pp. 251, 262 (1876) (Khandala, Mahableswar and Ghat Range); Butler, *ibid.*, v., p. 222 (1877) (Aboo); Hume and Marsh, *Game-B.* i., p. 247 (1878); Butler, *Cat. B. of Sind*, p. 54 (1879) (Aboo).

*Galloperdix spadicea*,—Ogilvie-Grant, *Cat. B. B. M.* xxii., p. 261 (part), (1893); *id.*, *Man. Game-B.* i., p. 206 (1895) (part); Blanford, *Avi. Brit. In.* iv., p. 106 (1898) (part); Oates, *Man. Game-B. In.* i., p. 215 (1898) (part).

*Description*.—*Adult Male*.—Differs from the adult male of *spadicea* in being everywhere much paler; on the upper parts the chestnut centres of the feathers are paler, and the grey margins wider; below the tint is much paler over the whole surface.

*Colours of Soft Parts*.—"Legs and feet coral red; bill dusky reddish; irides light brown" (G. King).

*Measurements*.—Wing, 153 to 173 mm., average 8 specimens, 159.7 mm.; tail, 116 to 136 mm., average 123 mm.; tarsus, 49 to 41 mm.; bill from front about 21 mm. and from gape about 26 mm.

"Weight  $8\frac{1}{2}$  to 10 ozs." (G. King).

*Adult Female*.—Very much paler both above and below than the female of *G. s. spadicea*; the black bars and markings are almost absent, being confined to narrow broken streaks on either side of the shaft and to dull mottlings on the inner secondaries. Below the chestnut is much paler, and the feathers are edged with paler grey, whilst the black markings are greatly reduced in amount. On the whole the differences between the females of this race and *G. s. spadicea* is even more marked than it is in the males.

*Colours of Soft Parts*.—"Legs and feet orange red to coral red; bill dusky red, irides dull yellow." (G. King).

*Measurements*.—Wing, 154-171 mm. (3 specimens); tail, 120 to 130 mm.; bill from front about 21 mm. and from gape about 25 mm.; tarsus, 49 to 51 mm.

"Weight, 8 ozs." (G. King).

*Distribution*.—The Aravalli Hills and Udaipur only. The birds from the Bombay Presidency South of these hills are at once strikingly darker and more chestnut than the Mt. Abu birds, and are nearer to the typical form, although somewhat paler and more grey than specimens from the Nilghiris and hill ranges of South India. These cannot, however, be given a name, as it is quite impossible to define any area for any special degree of depth of colouring.



*Nidification*.—I can find nothing beyond what is recorded in Hume's Nests and Eggs.

From Aboo Dr. King writes to me:—

“This species is common at Aboo in the valleys, ranging as high as 4,000 feet, but is most plentiful from about 1,500 to 3,000 feet above the sea. It prefers dense jungle about nullahs, and where there is a thick undergrowth and especially where there is much bamboo.

“I never took the nest myself, but its eggs were brought to me in the early part of May, and my shikaris and the Bheels employed said that the nests were flat and shallow, composed of dry bamboo leaves placed under, or even in the middle of, clumps of bamboo, in the deeper valleys.”

Col. Butler also wrote:—

“The Red Spur-Fowl is common all along the Aravallis. It is usually found singly or in pairs, and breeds like the last species during the hot weather, but I have often seen the chicks with the old birds after they have been hatched in May and June.”

I have not seen enough of these eggs to say whether they vary in size from those of the other races, but otherwise they are, of course, quite indistinguishable.

A pair in the British Museum measure  $46.2 \times 32.6$  mm., and  $44.7 \times 31.5$  mm. and a clutch of 3 in my own collection taken by Mr. Vidar measure  $35.8 \times 27.0$  mm.,  $35.6 \times 26.8$  mm. and  $36.5 \times 26.4$  mm. These are almost certainly abnormally small.

*General Habits*.—Like those of *G. s. spadicea*, but the Aravalli Spur-Fowl is less of a dense forest and thick jungle haunter than is that bird, and may be found more often in comparatively open forests and thin jungle.

It inhabits a country of comparatively small rain-fall, and less luxuriant vegetation hence its pale colouration. It is very common throughout the Aravalli Hills and the lower hills in Udaipur.

Col. Butler says that it is “common all along the Aravallis. It is usually found singly or in pairs and breeds during the hot weather.”

#### GALLOPERDIX LUNULATA.

##### *The Painted Spur-Fowl.*

*Curria Partridge*.—Lath., Gen. Hist. viii., p. 270 (1823) (India).

*Perdix lunulata*.—Valenc. & Diet. Sci. Nat. xxxviii., p. 446 (1825) (Bengal); Gray in Griffiths, ed. Cuv. iii., p. 48 (1829) (Bengal); Lesson, Traite, d'Orn, p. 504 (1831).



*Perdix hardwickii*,—Gray in Griffiths' ed. Cuv. iii., p. 48 (1829); Id. iii., Ind. Zool. 1, pl. 52 (1830-32).

*Francolinus nivosus*,—Delessert, Mag. de Zool. Ois., pl. 18 (Text) (1840); Id. Rev. Zool. 1840, p. 100 (Bengal).

*Francolinus hardwickii*,—Delessert, Voy. dans l'Inde, p. 26, pl. 10 (1843) (Pondicherry).

*Ithaginis lunulatus*,—Gray, List of Birds, pt. iii., Gall. p. 32 (1844).

*Galloperdix lunulosa*,—Blyth, Cat. Mus. As. Soc., p. 241 (1849) (Rajmahl.); Gould, B. Asia vi., pl. 69 (1854); Selater & Wolf, Zool. Sket. 2, pl. 41 (1861); Beavan, Ibis, 1868, p. 382 (Maunbhum); Blanford, Journ. As. Soc. Beng. xxxviii., pt. 2, p. 189 (1869) (Nagpur).

*Galloperdix lunulosus*,—Jerdon, B. India iii., p. 543 (1863); Marshall, B. Nest Ind., p. 59 (1877); Hume & Marshall, Game B. Ind., 1 pl. (1878).

*Galloperdix lunulatus*,—Hume, Nests and Eggs, Ind. B., p. 533 (1873); Ball, Str. Feath. ii., p. 427 (1874) (Chota Nagpur), v., p. 418 (1877) (Mahanaadi & Godaveri Rivers); vii., p. 225 (1878) (Ganges to Godaveri); Hume & Marshall, Game-B. Ind. 1, p. 254, pl. (1878); Markham, Str. F. ix., p. 206 (1880) (Allahabad); Butler, ibid. ix., p. 422 (1880) (Belgaum Dist.); Davison, ibid. x., p. 410 (1883) (Nilghiris); Barnes, Birds Bombay, p. 306 (1885); Taylor, Str. F. x., p. 531 (1887) (Orissa); Oates, ed. Hume's Nests and Eggs, Ind. B. iii., p. 425 (1890).

*Galloperdix lunulata*,—Ogilvie-Grant, Cat. Birds B. M. xxii., p. 263 (1893); Markham, Journ. Bomb. N. H. Soc. ix., p. 35 (1894) (Ken. R.); id., Man. Game-Birds I., p. 209 (1895); Oates, Man. Game-B. I., p. 220 (1898); Blanford, Faun. Brit. Ind. iv., p. 108 (1898); Finn, Ibis, 1899, p. 472; King, Journ. Bomb. N. H. Soc. xxi., p. 100 (1911) (Saugor); Whitehead, ibid. xxi., p. 163 (1911) (Schose); Pitman, ibid. xxii., p. 801 (1914) (C. Provinces, habits).

*Galloperdix lunulata*,—Oates, Cat. Egg & Brit. Mus. 1, p. 50, pl. iv., fig. 9 (1901).

VERNACULAR NAMES.—Askol (Orissa and Singbhoon); Hootkah (Gondhi); Cull-koli (Tamil); Jitta kodi (Telegu).

*Description*.—*Adult Male*.—Crown of head black, glossed with green, each feather having a white oval spot, these again sometimes with a narrow black centre; sides of head, nape and neck all round, throat and extreme upper breast brownish-black, each feather with a glossy black terminal, and a white sub-terminal bar; the chin is whitish or buffish-white, less spotted with black. Whole upper parts from hinder neck to shorter upper tail-coverts rich chestnut with white, black-edged ocelli, the white decreasing in extent towards the tail-coverts, and often absent or obsolete on lower back, and rump. Longer upper tail coverts and tail brownish-black, the rectrices with green or purple reflections in a good light.

Scapulars and innermost median and greater coverts like the back but with strong metallic green gloss; other coverts like the back, but with larger and more conspicuous ocelli; bastard wing and quills brown, some of the innermost secondaries glossed on the outer web with green like the scapulars. Smaller under wing-coverts and axillaries chestnut with black and white bars; greater coverts brown faintly edged with chestnut.



Breast and upper abdomen bright buff, each feather with a terminal spot of black, the buff palest next these spots; flanks chestnut, each feather with a buffy white bar between two black ones. The colours of the flanks and breast grade into one another.

Lower abdomen, vent and under tail-coverts brownish-chestnut, more or less spotted with insignificant black-edged white spots; the under tail-coverts are black-tipped, and the longest almost wholly of this colour.

There is not much individual variation in colour, though some birds are more spotted than others, and some have the head a deeper black than the rest.

*Colours of the Soft Parts.*—Legs and feet horny-green, plumbeous horny, or plumbeous; upper mandible blackish horny, lower pale horny especially at the base and gape; irides hazel brown or dark brown,

*Measurements.*—Wing, 144-161 mm., average 28 specimens, 153 mm.; tail, 128-135 mm.; tarsus, 42-45 mm.; spurs, generally two on each leg, sometimes less, sometimes three on each leg or on one only. The spurs run up to about an inch in length (25.4 mm.); Bill from front, about 19 mm. and from gape about 22-23 mm.

“Weight, 9-10 ozs.” (Hume).

*Adult female.*—Crown black, the feathers with chestnut stripes, occupying nearly the whole of each web on the forehead, and the posterior crown chestnut tipped as well; broad supercilia chestnut, the feathers with pale centres; ear-coverts deeper chestnut; chin, throat and cheeks pale yellowish-buff, mottled with chestnut; neck all round, upper parts and wings dark brown tinged with greyish-olive, especially on back, scapulars and lesser coverts. Upper tail-coverts browner than the back; tail deeper richer brown, absolutely rayed with black bars.

Below, the brown neck changes gradually to paler rufescent brown on breast and upper flanks, and then again to earthy brown on lower abdomen, vent and under tail-coverts.

Such variation as exists in adult females consists in the absence or prevalence of narrow terminal spots or bars on the lower plumage, and less often on the upper. These markings appear to have nothing to do with age, as old birds are to be found both well spotted and immaculate.

One female from Raipur is noticeable for its very bright, almost pure chestnut, breast.

*Colours of Soft Parts.*—Similar to the same parts in the male.

*Measurements.*—Wing, 138-159 mm., average 20 specimens, 146 mm.; tail, 128-145 mm.; tarsus, about 40 mm.; bill from front about 18 mm., and from gape about 21-22 mm.

“Weight, 8-9 ozs.” (Hume).



*The Young Male and Female* resemble the adult female, but are much duller. Above, the whole plumage is much freckled and weakly barred with dull black and rufous brown, and the tail and inner secondaries are chestnut brown, distinctly barred with black. Below, the whole surface is brownish, and the breast is no more chestnut than the rest of the plumage, but is more or less freckled with dull pale buff.

*The Chick in Down* is a rich chestnut rufous above, the head and a broad dorsal line darkest and brightest; below, a dull pale earth-brown, more chestnut on throat, upper breast, flanks, thighs and vent. The wing and tail feathers, when they appear, are dull rufous brown, vermiculated with black and with a few tiny buff ocelli on scapulars and innermost wing-coverts.

*Distribution.*—The distribution of the Painted Spur-Fowl is practically the same as that of the Red Spur-Fowl. Roughly to the North its boundaries are the Sind, Jumna and Ganges rivers, westwards it is found as far as the Eastern slopes of the coastal Hill Ranges, but not apparently on the Malabar coast itself or in Western Travancore, though it is found in suitable places throughout Coimbatore and Mysore. On the East it extends right up to the coast wherever the country is suitable.

*Nidification.*—There is not much on record about the breeding of this very common bird, and more detailed information is wanted. The breeding season appears to extend from February to June, the principal months being April and early May. It is of course resident wherever found, and breeds throughout the area it inhabits. The nest is the usual scrape, natural, or made by the birds, under the shelter of a rock, bush or tree trunk, and the only materials used are the fallen leaves and rubbish. The eggs are, I think, generally 3 in number, sometimes 2 or 4, and, rarely 5. In appearance they are hardly separable from those of the Red Spur-Fowl, but I think as a rule they are rather paler in tint, not so warm a buff-cream colour. They are just as smooth and fine-textured and the same long shape, but I have one clutch of 3 eggs in my collection which are very pointed and inclined to a peg-top shape.

The 15 eggs I have been able to measure vary in length from  $39.9 \times 30.3$  mm. to  $42.4 \times 28.4$  mm., and in breadth from the latter to  $41.6 \times 31.0$  mm., the average is  $40.6 \times 29.9$  mm. Like the other Spur-Fowl this bird is monogamous, and probably pairs for life.

Mr. Blewitt records that:—

“ The parent birds assiduously care for their young, and  
 “ when disturbed exhibit great anxiety for their safety. When  
 “ closely pursued, the old birds endeavour by many artifices to  
 “ draw the attention of the intruders from the spot where the



“chicks lie concealed, and invariably on the cry of a chick  
 “wounded or captured, the parent birds daringly return to the  
 “rescue, often to within a dozen yards or so of the sportsman.  
 “The chicks are very soon able to fly as well and as fast as  
 “the old birds, and it is then not easy to get very near  
 “them.”

*General Habits.*—This Spur-Fowl is not so restricted to dense forest or bamboo cover as the last species, and appears rather to haunt broken ground with numerous boulders and rocks amongst the vegetation, and this love of rocks and rocky ground seems to be the principal cause in restricting its haunts, for in wide stretches where these are absent, no birds will be found, though in suitable areas on either side it may be common. Neither does it ascend the hills to the same height as does the Red Spur-Fowl, and probably few birds live at altitudes over 3,000 feet, though the evidence on this point is very scanty.

Major C. R. S. Pitman says that he found them extraordinarily common in the Central Provinces on rocky hills of Granitoid Gneiss covered with forest, bamboo and thorn jungle, with thin scrub and grass on the tops. Here they seemed to prefer the crests of the hills where the cover consisted of this scrub and grass rather than those parts lower down with tree forest, and the more open this cover, the greater the certainty of finding several pairs of Painted Spur-Fowl.

In a letter to me Major Pitman writes:—

“It much prefers running to flying, and is fond of scuttling  
 “about amongst rocks or standing on the highest one of some  
 “group of rocks and thence surveying the country all round it.  
 “During three weeks I saw many every day, and, though  
 “when hard-pressed they are not difficult to flush, flying rather  
 “like a partridge. I never saw one fly up-hill unless occasion-  
 “ally when birds flew down from one hill across a col to the  
 “next one. Then if flushed again, they would sometimes fly  
 “back to their original crest. Down-hill they fly readily enough  
 “however steep and seem to get along equally well whether  
 “hurling themselves down obliquely or at the steepest angles.  
 “I have often noticed both sexes perch in trees when fright-  
 “ened whether by dog or man, possibly to see better what  
 “was worrying them; even then though they had to fly *up* it  
 “was either a sort of scramble from directly below or a point  
 “used as a rest as they flew down-hill.

“When frightened on the slopes at the bottom of a hill,  
 “they invariably make for the top running, all with a view of  
 “eventually being able to look back from some high vantage  
 “point. Thus I found an excellent way of shooting them was  
 “to walk along the hill crests with a beater on either side



“ of the hill about 50 yards below me. By this means  
 “ birds from the slopes would always run up and were  
 “ then flushed together with those which were originally on  
 “ the top.

“ I cannot agree with some descriptions of this bird which  
 “ say that it is difficult to flush, and even when flushed at  
 “ once makes straight for the thickest cover. My experience is  
 “ that males when first put up usually fly along the crest of  
 “ the hills, and after being flushed a couple of times or so,  
 “ break back; broods and pairs flew straight down-hill, and  
 “ at once started running up again. On such occasions they  
 “ generally just went over the crest and squatted a few yards  
 “ down the opposite slope.

“ When flushed the males get up with a curious bubbling,  
 “ scolding, chuckling noise and at night I heard this same  
 “ cry on the rocky hills.

“ Females with broods, whether young chicks or nearly  
 “ fullgrown, in the first instance usually led them away by  
 “ running, uttering at the same time a peculiar scolding  
 “ chuckle. Even under these circumstances they were always  
 “ so eager to climb to the tops of rocks and look back that  
 “ one could often get right up to them.

“ Their food seemed to consist of seeds, berries, grain and  
 “ other vegetable matter. In the crops of all I examined  
 “ there was a soft dark brown mash with occasionally a few  
 “ small seeds distinguishable in it, and I also found a lot of  
 “ stale dry mowrah flowers in their crops after the middle of  
 “ May.

“ The legs of the males I examined had from two to three  
 “ spurs, in one case three on both legs, the females had from  
 “ one to two, often two on each leg.”

Jerdon does not think much of it as an article for the table, he writes :—

“ Its qualities for the table are inferior to those of the last  
 “ species, having less flavour and being more dry. Numbers  
 “ are snared in the hills not far from Madras, and are generally  
 “ procurable in the Madras market. I have kept them in  
 “ confinement for long. They thrive pretty well, but the  
 “ males are very pugnacious. The males have a fine cackling  
 “ sort of call, very fowl-like.”

It should be noted that Capt. Baldwin states that this Spur-Fowl when running carries “the tail up, not like a partridge.” This must surely be wrong, but I have never seen it contradicted, and unfortunately skins will not either refute or confirm this, and some sportsman should remember to take observations which will enable him to do one or the other.



## GALLOPERDIX BICALCARATA.

*The Ceylon Jungle-Fowl.*

*Perdix bicalcaratus*,—Pennant, Ind. Zool., p. 40, pl. vii. (1769).

*Perdix zeylonensis*,—Gmel. Syst. Nat. 1, pt. ii., p. 759 (1788); Bonnat., Encycl. Meth. 1, p. 210, pl. 93, fig. 3. (1791).

*Perdix ceylonensis*,—Lath. Ind. Orn. ii., p. 644 (1790); Temm., Fig. et. Gall. iii., pp. 311, 718 (1815).

Ceylon Partridge, Lath., Gen. Syn. Suppl. ii., p. 278 (1802).

*Francolinus ceylanensis*,—Less., Traite d'Orn., p. 504 (1831).

*Galloperdix zeylonensis*,—Blyth., Cat. Mus. As. Soc., p. 241 (1849); Gould, B. Asia vi. pl. 67 (1854); Hume, Nests & Eggs Ind. B. p. 535 (1873).

*Galloperdix bicalcarata*,—Layard, Ann. Mag. Nat. Hist. (2) xiv., p. 105 (1854); Blyth, Ibis 1867, p. 308; Holdsworth, P. Z. S., 1872, p. 469; Legge, Ibis, 1874, p. 26; 1875, p. 400; id., Birds Ceylon iii., p. 741, pl. (1880); Hume, Str. Feath. vii., pp. 430, 453 (1878); Hume & Marshall, Game-B. Ind. i. p. 261 pl. (1878); Oates, ed. Hume's Nests & Eggs Ind. B. iii., p. 426 (1890); Ogilvie Grant, Cat. Birds B. M. xxii., p. 264 (1893); id., Man. Game-B. 1, p. 210 (1895); Butler, Journ. Bomb. N. H. Soc. x. p. 31 (1896); Blandford, Faun. Brit. Ind. iv., p. 109 (1898); Lewis, Ibis, 1898, p. 551; Oates, Man. Game-B. 1, p. 224 (1898); Wait, Spolia Zeylanica x, pt. 3<sup>o</sup>, p. 371 (1917).

TERNACULAR NAMES. Haban-or Saban-kukula (Cinghalese).

*Description*—*Adult Male*.—Crown, nape, hind neck, back, scapulars and wing-coverts black with white central lines; on the head these are very narrow, but gradually broaden towards the back until on the outer wing-coverts they become large pear-shaped drops. The bases of the feathers of both back and wing-coverts are pale brown or chestnut brown, vermiculated with blackish, and these show through everywhere; on both the lower back and greater wing-coverts the feathers have broad chestnut edges vermiculated with black and grade gradually into the chestnut rump and shorter tail-coverts. The rump is sometimes immaculate except for a terminal black spot or narrow bars of buff and black, at other times there is a certain amount of black vermiculation; the coverts are invariably freely vermiculated with black and the longer tail-coverts and tail are black, the central tail feathers sometimes, and the outer feathers on the bases nearly always, vermiculated with chestnut.

Primaries brown; secondaries brown, vermiculated with chestnut on the outer webs, the innermost on both webs; greater coverts like the quills, but with white pear-shaped black-edged ocelli at the tips.

Sides of head white, the feathers with tiny edges of black; chin and throat pure white. Neck, breast, flanks and abdomen white, each feather black-edged. On the flanks the black edges dominate so that this part of the plumage is almost black; the upper breast is boldly black and white, and the centre of the abdomen almost



white. Vent, posterior, abdomen and flanks dull earth-brown with white spots. Under tail-coverts blackish-brown with grey tips.

The extent to which individual variation is found is in the proportionate amount of black and white on the feathers of the breast and lower parts and in the amount of vermiculation on the back rump and upper tail-coverts.

*Colours of Soft Parts.*—"Iris brownish-yellow or brownish-red; orbital skin red; bill, legs and feet red; spurs dusky reddish." (Legge.)

*Measurements.*—"Length, 13.5 to 13.8 inches." (Legge.) Wing, 151 to 174 mm., average of 20 specimens, 164 mm., tail 121 to 130 mm.; tarsus, 54 to 57 mm.; bill at front about 22 mm., and from gape about 25 mm. The spurs run up to about 20 mm., and are more generally about 12-15 mm.

I can find no records of weight.

There are usually two spurs on each leg, sometimes only one on one, and sometimes as many as three.

*Adult Female.*—Crown blackish-brown, the feathers of forehead and sides with paler centres; sides of the head dull chestnut, the feathers black-edged. Whole upper plumage and wing-coverts dull chestnut vermiculated with black, most profusely so on the longest upper tail-coverts. Tail black, the two central pairs of feathers faintly vermiculated with chestnut.

Quills brown, the secondaries all vermiculated with chestnut on the outer webs, and the innermost on both webs.

Below, chestnut, practically immaculate on the breast, and more and more vermiculated with dark brown towards the vent. Vent, posterior, abdomen and flanks earthy chestnut; under tail-coverts darker chestnut, densely vermiculated with black.

*Colours of Soft Parts.*—"Iris brownish-yellow; bill, legs and feet lighter red than in the males." (Legge.)

*Measurements.*—"Length, 11.75 inches." (Legge.)

Wing, 143 to 150 mm., average 8 specimens, 146 mm.; tail, 108 to 110 mm.; tarsus, 46 to 48 mm.; bill from front about 18 mm. and from gape about 22 mm.

The spurs are small, seldom as much as 12.5 mm., and number either one or two on each leg, sometimes, however, wanting on one or both legs. Wait says that the females are *generally* without spurs, but this is not so with the British Museum series.

*Distribution.*—This Spur-Fowl is found only in Ceylon, and only in those portions which are well forested and have an ample rain-fall. Thus it is very common in the South-Western portion, more or less common in the West and East, but is not found in the extreme North-West nor in the North-Eastern portion of the island.

*Nidification.*—The breeding season of the Ceylon Spur-Fowl lasts almost throughout the year. Wait says that it appears to be



from about November to March or April and occasionally again in July and August. I have a pair of eggs taken in June, and Hart found them in October. Possibly February and March are the two months in which most eggs are laid.

The nesting arrangements are much the same as those of the Red and Painted Spur-Fowls. No real nest is made, but the eggs are laid in some shallow hollow under the protection of a bush or thick clump of creepers or grass, and the only lining is the mass of fallen debris carpeting the whole forest. The site selected appears always to be in very thick cover, and, preferably, in evergreen forest with dense undergrowth.

Undoubtedly the number of eggs most often laid is two. Wait says "usually two, sometimes more," but I understand that three is the largest number he has personally seen or taken. Legge found two only, but the natives told him that they laid up to four, and Hart records it as laying from 4 to 6 eggs. Personally I have never seen a genuine clutch of more than three, but believe four may rarely be found.

They are like other Spur-Fowls' eggs, but of a warmer tint of buff or café-au-lait, and are not so elongated.

The eggs measured by W. E. Wait averaged  $1.60'' \times 1.16''$  ( $42.1 \times 30.4$  mm.), but 3 in my collection and a few others which have passed through my hands average only  $39.1 \times 28.9$  mm. The largest  $40.2 \times 29.0$  mm. and  $39.0 \times 29.5$  mm. and the smallest  $38.0 \times 28.4$  mm. and  $39.4 \times 28.3$  mm.

Like other Spur-Fowls, the Ceylon bird is monogamous, and the cock and hen remain together throughout the year.

*General Habits.*—The Ceylon Spur-Fowl may be found within the damper regions of Ceylon at all heights from the broken ground of the foot hills up to 4,500 feet or even 5,000 feet, and according to Wait "spreads further into the dry flat country between the hills and the sea" on the South-East. Ample cover is essential. Legge records that:—

"The shy habits of this bird would prevent its being detected in most places where it is even abundant, were it not for its noisy cries or cackling, so well known to all who have wandered in our Ceylon jungles.

"It frequents tangled brakes, thickets in damp nullahs, forest near rivers, jungle over hill sides, and in fact any kind of cover which will afford it entire concealment.

"It runs with great speed, and has the knack of noiselessly beating a retreat at one time, while at another it ventriloquizes its exciting notes, until the sportsman becomes fairly exasperated, and gives up the attempt he has made to stalk it in disgust. I have more than once endeavoured to cut off its retreat or flush it by rushing into a little piece of jungle



“or detached copse in which I had found it, and from which  
“it seemed impossible for it to escape, but I invariably failed  
“in the attempt, a failure aggravated by my utter bewil-  
“derment at its unaccountable disappearance.

“The cock birds begin to call at six in the morning, and  
“when one has fairly commenced, the curious ascending scale  
“of notes is taken up from one to another, until the wood re-  
“sounds with their cries.”

Most writers give the Ceylon Spur-Fowl the credit of being a strong swift flyer when once it is forced to take to wing, and its flight is possibly stronger than that of its Indian relations whose powers in this respect are not very great. Like them, however, it is a skulker of the most crafty and persistent description, and very hard to flush. Even dogs only force it up into the nearest thick bush or tree, where it will lie concealed and quiet until it thinks all danger has passed.

Everyone seems to agree that it is hard to rear from eggs and almost impossible to tame if caught. If precautions are taken to prevent its killing itself against the roof or sides of its cage or enclosure when startled, or if they do not quickly die from unsuitable food or refusal of all food, they still always remain shy, wild birds, resenting observation and also the presence of other birds or beasts.

They are constantly trapped by the natives, who lay snares for them in the places they most frequent for feeding purposes. A favourite trap described to me by a Mr. Kellow, formerly a tea-planter in Ceylon, is said to consist of little triangles made by two fences with open bases and open apexes, in the latter of which are numerous nooses into which the birds walk, led thereto by the fences which they run along in preference to jumping or flying over.

They are also said to be decoyed into a ring of nooses by a captive bird, for the cocks are very quarrelsome, and the cocks in the vicinity soon come to the challenge of another invading their sanctuaries. As far as I could ascertain, however, the decoy system was one introduced into Ceylon by immigrant Tea labourers, and used by them only.

Legge remarks that in their manner of fighting the males reminded him of the game-cock, both in the way they elevated and depressed their heads and in the way they imitated one another's action.

The flesh is very good eating, and has been likened to that of Grouse. Their own food is both vegetarian and insectivorous, and they are particularly fond of the ripe berries of that imported pest of Ceylon, the Lantana bush. Hart says that their diet is principally white ants, and various other insects and their larvæ.

Its powers of ventriloquism have already been referred to above, and this has been corroborated by many observers. So great indeed



is this power that Layard says that when listening to birds confined in his aviaries, he could have declared that the calls proceeded from every part of the ground rather than from the aviary itself.

#### OPHRYSIA SUPERCILIOSA.

##### *The Mountain Quail.*

*Rollulus superciliosus*,—Gray., Knowsl. Menag., Aves. p. 8, pl. xvi. (1846) (India).

*Ophrysia superciliosa*,—Bonap. Comp., Rend. xliii., p. 414 (1856) (no loc.); Hume, Str. Faath. vii., p. 434 (1878) (no loc.); Hume & Marshall, Game-B. Ind. ii., p. 105 pl. (1879) (Mussorie, Nainital); Ogilvie-Grant, Cat. Birds B. M. xxii., p. 266 (1893); id., Handb. Game-B. 1, p. 212 (1895); Blanford, Faun. Brit. Ind. iv., p. 105 (1898); Oates, Man. Game-B. 1, p. 121 (1898); Comber., J. Bomb. Nat. Hist. Soc. xvi. p. 361 (1905).

*Ptilopachus (Ophrysia) superciliosa*,—Gray, List Gallinæ Brit. Mus., p. 45 (1867).

*Malacoturnix superciliosus*,—Blyth, P. Z. S. 1867, p. 475 (Mussorie); Gould, B. of Asia vii., pl. 8 (1868).

*Malacortyx supercilialis*,—Blyth, Ibis, 1867, p. 313.

*Coturnix (Ophrysia) superciliosa*,—Gray, Handl. B. ii. p. 269 (1870).

VERNACULAR NAMES. None known.

*Description*,—*Adult Male*.—Forehead and a broad supercilium reaching to the nape white, a band above and below this supercilium black; chin, throat, sides of the face and upper ear-coverts black; lower ear-coverts and cheeks white, extended in a broken band down the sides of the throat; a spot in front of the eye and another behind it white; crown greyish-brown with velvety black central striæ. Plumage, generally, above and below dark clear slaty olive-brown, each feather with black edges to the basal four-fifths of each web except on the longest tail-coverts and tail feathers. Under tail-coverts black with broad white terminal bars.

The wings are rather browner and lighter than the rest of the upper plumage, and the primaries are vermiculated with pale dull buff on the basal halves of the outer webs.

*Colours of Soft Parts*.—"Bill coral red; legs and feet dull red or dusky red" (Hutton).

*Measurements*.—"Length 10 inches" (Hutton).

Two specimens in the British Museum. Wings, 86 mm. (in moult), and 95 mm.; tails, 80 and 82 mm.; tarsus, 29 mm.; bill from front 11.5 mm., and from gape 13.5 mm. two other specimens not quite adult have wings of 85 and 86 mm.

*Adult Female*.—Above cinnamon brown, the centre of the crown with practically no markings, nape and neck with broad black streaks changing to triangular black spots on the back, scapulars, rump and upper tail-coverts which are bordered with fulvous, more especially on the scapulars. A white spot both in front and behind the eye, and a small white eyebrow. A broad supercilium, ear-coverts and sides of the head vinaceous-brown, merging into albescent

on chin and throat; a broad black band on either side of the crown and a black patch under the eye next the beak.

Wings like the back; primaries light brown, mottled with buff on the outer webs, the mottlings gradually increasing in depth of colour and extent towards the innermost secondaries which are like the back.

Below a beautiful pale, but bright, vinaceous brown, each feather with a broad black central stripe and faint chestnut edgings; flanks and vent vermiculated with brown and black.

*Colours of Soft Parts.*—"Bill dusky red, lower mandible brightest; legs dull red; eyelids black, with a small white spot at the corners". (Hutton.)

*Measurements.*—Two females in the British Museum collection. Wings, 88 and 93 mm.; tails, 70 and 71 mm.; tarsus and bill, not different in size to that of the males.

*Young Male.*—Judging from a specimen in the British Museum collection, the young male must be somewhat like the female, as it still retains a few buff and brown mottled wing-feathers and a certain amount of mottling on the breast.

*Distribution.*—As yet only known from Mussoorie and Naini-Tal.

*Nidification.*—Unknown.

*General Habits.*—The 10 specimens enumerated by Hume in *Game-Birds* remain the only known specimens of this bird. The original specimens were a pair in the Knowsley Collection, and their origin was unknown but supposed to be "from India". This was in 1846. In 1865 Kenneth Mackinnon shot a pair near Mussoorie in the month of November, and in the following year from November to June, 1868, there were several birds, or covies of birds at Jerepani at about 5,500 feet elevation, and five specimens were procured, and finally Major G. Carwithin shot one at Sher-ka-danda, 7,000 feet, near to Naini-Tal. Since then this bird has never been seen again. Kenneth Mackinnon, writing to Hume about the birds he sent, said :—

"It was shot together with a second, also a male, out of a covey of 8 or 10 in grass jungle on the southern face of Budraj.

"I noticed that nearly half the birds, probably females, were brown, rather darker than the ordinary game brown. They were very difficult to flush, and, but for the dogs, we could not have got them up. After being flushed they collected again at some distance with a shrill whistling unlike that of any of our other birds. Their flight was slow and heavy, and I should never have supposed them capable of migrating far.

"I saw these birds frequently after this, and have frequently heard their whistling when outshooting near Mussoorie. They



“are not confined to the spot where I shot that brace, I have  
 “seen and heard them at other similar places, at about the  
 “same elevation, in the neighbourhood of Mussorie, but to the  
 “best of my recollection only during the winter, but of this  
 “latter I am not sure.”

Capt. Hutton's boys knocked over three specimens, one of which was destroyed, and again a fourth in December. Hutton writes of these as follows:—

“There were only 5 or 6 birds in this covey, and all young  
 “apparently. This one was shot with a pistol, as we find the  
 “gun of little use, the birds refusing to take wing and only  
 “running among the long high grass when pressed, and allow-  
 “ing themselves to be nearly trodden upon before they will  
 “move. During the forenoon they wander to feed up among  
 “the long-grass to which they obstinately cling, feeding on the  
 “fallen seeds, and their presence being made known by their  
 “short Quail-like note. They will not come out into the open  
 “ground, and in the afternoon they descend into sheltered  
 “hollows amongst the grass and brushwood.”

Major Carwithin records of the bird shot by him that it was shot by him on the eastern slopes of Sher-ka-danda when beating for Cheer-Pheasant. The ground is described as “very steep, with patches of brushwood here and there.”

The above contains all we know about these birds, and Hume thought that they were migratory birds probably breeding in South-Eastern Chinese Tibet. Judging, however, from what we know of their habits, I should think it is more probable that they are resident birds, and that Mussorie and Naini-Tal probably form the outposts of their habitat in native Garhwal and Nepal. Their skulking habits and the extraordinary persistence with which they refuse to fly would suffice to keep them unknown to any but the most observant of sportsmen, and as the few that are flushed generally would get up when men were expecting pheasants, they would probably not waste shot upon such small fry.

Probably we shall have to wait until someone with time, patience and acute powers of observation makes a regular business of once more locating and obtaining these birds. Once found, their very habits should make them an easy prey to clever netters, and perhaps we may see some before long in the Zoological Gardens in India and London.

(To be continued.)

## SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY

## No. XXII.

By

OLDFIELD THOMAS, F.R.S.

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## A.—A NEW BAT OF THE GENUS RHINOPOMA FROM S. E. PERSIA.

The following new bat belonging to the genus *Rhinopoma* occurs among the collections made by Col. J. E. B. Hotson:—

## RHINOPOMA PUSILLUM, sp. n.

A species of the *cystops* group, smaller than any as yet described.

General build light and delicate, about as in *R. muscatellum* and *seianum*, but size still smaller. Connecting band of ear well developed. Feet small and very slender. Tail short, slightly shorter than the forearm, the converse being generally the case in all the smaller forms of *Rhinopoma*.

Skull with the prominent nasal inflations characteristic of the *cystops* group, and these proportionally a little higher; top of muzzle, as seen in profile and compared with the line of the tooth row, slanted downward anteriorly in *cystops*, horizontal in *muscatellum* and *seianum*, upwards anteriorly in the new form, though very slightly so. Sagittal crest well developed anteriorly. Bullæ not so large as in *muscatellum* and *seianum*.

Molars smaller than in any of the allied species. Canines shorter, comparatively broad at base.

Dimensions of the type, measured on the spirit specimen:—

Head and body, 54; tail, 46; ear, 17·5; lower leg and foot (c.u.), 32; hind foot (c.u.) 11·3. Skull:—greatest length, 15·5; median naso-occipital length, 14; zygomatic breadth, 9·2; breadth across nasal inflations, 5·5; mastoid breadth, 8; length of bulla, 4·4; basal diameter of canine, 1·1; front of canine to back of m<sup>3</sup>., 5·3; combined length of m<sup>1</sup>. and m<sup>2</sup>., 2·6.

*Hab.*:—Sib, S. E. Persia, near the Perso-Baluchistan frontier.

*Type*:—Old female in spirit B.M. No. 20.1.19.3. Collected by Col. J. E. B. Hotson, presented by the Bombay Natural History Society. One specimen only.

Considering how near are the respective localities I had expected this would prove to be *seianum*, but it is readily to be distinguished by its small size, much smaller teeth and shorter tail.



# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

(INCLUDING THOSE MET WITH IN THE HILL STATIONS  
OF THE BOMBAY PRESIDENCY.)

BY

T. R. BELL, I.F.S. (RETD.).

(Continued from page 954 of Vol. XXVI.)

## PART XXV.

### 39. Genus—*VIRACHOLA*.

Eyes hairy; body robust. In the male there is tuft of hairs turned upwards from the inner margin of the fore wing, these hairs fixed on that margin; in the hind wing there is also a male sexual mark: glandular, depressed, on the upper surface, near the base, pear-shaped with the narrow end directed towards the base, extending slightly below the costa into the discoidal cell and reaching as far out as the discocellulars; the palpus of the male shorter than that of the female; the hind wing with an anal lobe and a thin threadlike tail at the end of vein 2. The genus contains three species, all belonging to the Indian region. Two of these are found throughout India except in the absolutely desert tracts and in Ceylon; the third is confined to the Andamans. The transformations of the two Indian species are known and have often been described; they will be found below. The larvæ and pupæ are very similar to those of *Deudorix* and *Bindahara* and the larvæ all feed on the inside of fruits of different sorts. They are all, the butterflies of the present genus that is, very powerful fliers, quick and agile and capable of traversing long distances. Our two species, *isocrates* and *perse*, are both fond of the sun and the males bask on the tops of high trees, sitting with the wings half-open as long as the sun is bright. They rest, with them closed, under leaves, &c.

**196. *Virachola perse*, Hewitson**—Male. *Upperside*: Fore wing with the costa above the median vein up to the base of vein 2 deep black: the apex broadly black; the black colour occupying the whole apical space and outer margin, leaving the inner and lower portion of the wing blue; sometimes with an ochreous-red patch varying in size outside the cell. Hind wing with the costa broadly black, the band narrowing suddenly round the apex and continued narrowly down the outer margin to the anal angle; abdominal space also rather broadly black; the fold grey; the remaining inner space blue; the anal lobe black, with a dull ochreous spot in it; tail black, tipped with white; *cilia* of both wings black. *Underside*: vinous-grey, sometimes with a red tinge; markings darker grey, pale-edged. Fore wing with an irregular, rather large spot at the end of the cell with dark edges; a discal band of conjoined spots from the cost to near the submedian vein; the lowest small, the first four outwardly oblique, the others straight down, commencing a little inwards. Hind wing with a black, subbasal spot below the costa. twin spots at the end of the cell: a discal band of conjoined spots, the third and fourth a little outside the others, its lower part curving suddenly in towards the abdominal margin below its middle; anal lobe black, a small, round black spot in the first interspace, ringed with ochreous. Antennæ black, ringed with white, club with an ochreous-red tip; frons grey; eyes ringed with white: head

and body black above, grey beneath.—Female. *Upperside* paler blue, without gloss. Fore wing with broad, costal and outer, marginal, black borders, a white patch, sometimes tinged with ochreous beyond the cell. Hind wing with the costal and outer, marginal, black borders broader than in the male; abdominal space clear of blackish suffusion; the fold blackish-grey; a white, anteciliary line from the anal lobe to vein 2. *Underside* paler than the male, markings similarly disposed, but more defined. Expanse: male, 35-50mm; female, 45-60 mm.

*Egg*.—Hemispherical, very much flattened in shape. Surface pitted all over with small cells which may be hexagonal but their shape is obscured by the thick, coarse walls which are double the diameter of the cell—apertures; there are some scattered thickenings of the intersections of cell walls; on the very apex of the egg there is a more or less circular depression, the bottom of which is minutely pitted. The egg is broadest just above the base. The colour is green as seen at the bottoms of the cells and apical depression; the cell-walls are all white obscuring most of the ground-colour. B: 1.75mm.; B: 1mm.

*Larva*.—Nearly exactly the same as that of *V. isocrates*. Head of medium size, light yellow-brownish; shining. The surface shining: covered with similar black hairs but slightly longer than in *isocrates*; the other hairs also longer: instead of one hair, subdorsal, on each segment there are here three or four subdorsal on each side on segments 4-6 and two on 8-10; the little wart-like tubercular swellings below each spiracle bear some rather longer, white bristles; the edges of the shovel perhaps more tumid. The spiracles large, oval, black. The colour indigo-brown; segments 1-3 orange-brown; marks on segments 7, 8 are light-cream coloured; segments 11-13 same colour as 1-3, but somewhat darker; the spiracles of segment 12 larger, L: 25mm.; B: nearly 7mm.

*Pupa*.—Similar to that of *isocrates* but the constriction more pronounced because the abdomen is more swollen at segments 7 and 8 where it is highest and broadest; circular in transverse section. Surface covered with minute hairs sparsely, more dense round spiracles and a little longer along the front margin of segment 2; the thorax is more humped than in *isocrates*. Spiracles of segment 2 facing slightly forwards instead of being flush; the other spiracles long and narrow, dark-brown. Colour dirty light-brown. L: 16 mm.; B: 7 mm.

*Habits*.—Exactly the same as those of *V. isocrates*. They do not deviate in any single particular from them; ants only attend the larvæ as scavengers and not as visitors except that they may occasionally find some of the sugary ferment on the backs of the latter that might attract them—there should be a good deal of the sort adhering to a bristle-bearing surface. The butterflies are strong and rapid in flight and difficult to catch; the males bask also, like those of *isocrates*, but are not found at the tops of hills so much; they do not commonly visit flowers, neither do they go to water. The habitat of *perse* in India is from the Himalayas to the South. It is, seemingly, confined more to the jungles than the other species, *isocrates*, and is certainly more plentiful on the sea-coast in Kanara than that species, and continues plentiful as far as the jungle lasts to the east, say to where the rainfall diminishes to 40 inches. The commonest foodplant is *Randia dumetorum* (fruits).



**197. *Virachola isocrates*, Fabrisius.** Male (Pl. H., fig. 54)—*Upperside*: violet brown. Fore wing: with the colour darkening on the margins in certain lights, showing a bright violet gloss on the inner area; an indistinct orange-ochreous patch, varying in size in different examples, beyond the cell, only visible in certain lights. Hind wing: with the costal area and abdominal fold blackish-brown; anal lobe whitish with a black spot in it, varying in size in different examples, with some pale bluish-white scaling on its upper side, in some examples the black spot nearly fills the whole of the anal lobe: tail black, tipped with white. *Cilia* of both wings with the basal part black, the outer half white, becoming bluish-grey below the tail and round the anal lobe. *Underside* vinous-grey, or slaty-grey, markings darker than the ground colour, edged on both sides with white. Fore wing with a bar at the end of the cell, a discal band of conjoined spots, decreasing in size hindwards, nearly straight down, from near the costa to below vein 2, where the spot is very small. Hind wing with similar discoidal bar and discal band, the latter somewhat irregular; the third, fourth and sixth spots a little outside the others, then the band, with a sudden curve, reaches the abdominal margin a little below its middle: anal lobe black with a white spot on its upper inner side, a smaller black spot ringed with orange in the first interspace, with some blue, grey and white scaling between them; both wings with indications of a narrow, submarginal band and very fine, marginal, grey line. Antennæ black, ringed with white. club with an orange tip, with a white streak below at its base: frons greyish-white; eyes ringed with white; head and body above and below concolorous with the wings, abdomen below white.—Female. (Pl., H., fig. 54a)—*Upperside* brown. Fore wing: with the colour darkening towards the margins, the orange-ochreous patch larger and more distinct and varying much in extent, in some examples extending broadly to the base below the median vein. *Upperside* as in the male, but the bands are broader and more outwardly curved; the black, anal spots larger. Expanse: male, 40—45 mm.; female, 45—50 mm.

*Larva*.—The *shape* is exactly the same, practically, as that of *Deudorix epijarbas*, with the same kind of anal end, i.e., a “shovel,” circular and flat, on the dorsal areas of segments 12-14; the general style of marking is also similar. *Head* rather small, hidden under segment 2, shining, round in shape and dark-brown in colour; segment 2 semicircular in shape, thickened round the margins, slightly emarginate in dorsal line on front margin, evenly convex transversely, with a dorsal depression which has on it a double, fine, dorsal line flanked on either side by a small, black spot: segment 3 broader and higher than segment 2, flat on dorsum or top, rising suddenly from the front margin, that is forming a perpendicular declivity from the surface of segment 2; segments 4-6 shorter than 3, the body highest at segment 4, each of the segments 4-6 with a transverse dent on dorsum: segments 7-10 about the same breadth—the larva is broadest at segment 3—with, each, a small, dorsal, elliptical indentation; segments 3-10 have also a lateral, central longish depression or dent parallel to the front and hinder margins: segment 11 is dorsally flat (as in *Deudorix*) and not very distinguishable from the succeeding “shovel” segments: the surface of the shovel-disc is pitted and the margins raised: all segments very distinct except the anal ones, especially on the dorsoventral margin which is somewhat flanged or thickened all round: segment 13 about the same breadth as segment 2 and the hinder margin of 14 is semicircular. The *surface* of the larva is shining-oily looking, covered with many small, tubercular, black hairs: front margin of segment 2 and the whole dorsoventral margin of body with a row of fine, short, white hairs much longer than the tubercular, black ones: on top of each segment 3-10

is a sublorsal, erect, white much longer hair, each rising from a small swelling; bases of legs and prolegs also finely hairy. *Spiracles* are oval, shiny-brown and sunk in depressions. *Colour* of the body is a dark indigo-blue with the front margins of segments 2, 3 broadly yellow, top of segment 3 also yellow, with a dorsal, blue line; segments 7, 8 with a large, dorsal, square, whitish patch over both of them, the whole length of the segments and about one-third of the breadth, with a semicircular, small, blue indentation on the dorsal line of each near the hinder margin; these two segments 8, 9 have also a whitish blotch under each spiracle; segments 11-13 are translucent-looking grey as well as the ventrum; legs shining glassy-yellow. The organs on segment 13 are small and cylindrical, occasionally protruded from the circular orifices, white; gland not perceptible. L: 20 mm.; B: 6 mm.

*Pupa*.—Is quite normal in *shape*; *head* under segment 2 which over-reaches it in a thin margin ever so slightly, eyes prominent with a central, shiny depressed line; antennæ hardly distinguishable between eyes and margin of segment 2; segment 2 transversely convex, sloping up to the hinder margin very steeply, rounded in front—that is the front end of pupa is rounded; thorax with its front ascent in the same plane as that of segment 2, only slightly humped, rather long, the hinder margin running into segment 4 in a point on dorsal line; constriction slight and gradual; abdomen and thorax the same breadth to segment 8, transverse section at segment 8 circular, slightly depressed; segmental divisions distinct, that between 9, 10 especially accentuated—that is the segmental membrane is visible; segment 11 to anal extremity are, dorsally, in a plane very nearly perpendicular to the longitudinal axis of the pupa—the passage from 10 being of course evenly rounded; the anal segment itself turned under ventrally. The *surface* is sparsely covered with minute, comb-topped hairs which are denser round the front margin of segment 2 and round the spiracles; otherwise pitted and dull. *Spiracles* of segment 2 are long, prominent, velvety-looking and light in colour; the rest are in small, circular depressions, slightly prominent, oval, brown in colour and conspicuous. *Colour* of the pupa is brown-pinkish suffused with blackish; wings light reddish-brown, spotted and splashed with blackish; a blackish, dorsal, blotchy line and row of dark, lateral spots on abdomen; sides of thorax and head blackish. L: 16 mm.; B: 6.25mm.

*Habits*.—The egg is laid on flowers, fruits, stalks, leaves, &c., always one at a time. The little egg-larva eats into the carpel or the fruit, wandering until it finds one, if born otherwise than in a flower or on a fruit. The mother-insect generally chooses a fruit that is not too far advanced and often a flower—to give the small larva a chance: what it does when the egg is laid on bark, leaves, &c., is a matter of conjecture. Certain it is, however, that many eggs are laid which never come to anything; also many larvæ bore into fruits that never reach maturity—possibly because they cannot get inside the hard stone? For it is in the interior of the stone, in the case where a tree with a stoned fruit is chosen that the larva chooses to live and feed. When well-grown it does not seem to have any difficulty about piercing the stone and during its habitation of the inside, which means during the time it has sufficient food to go on with, it enlarges the perforation so as to admit of its passing its body through it as it finds necessary. When it has



finished one fruit, hollowed it out completely that is, it wanders out and looks for another,—it is generally at these times, in all probability, that many get eaten by birds, &c. When the fruit chosen is large enough to accommodate more than a single larva, there may be several in it. In these cases where one large fruit—such as a Pomegranate for example—contains only a few larvæ of small size, it takes them a long time to finish the contents. In the course of time, also, the gradual demolition of the vital parts of the inside, would and does lead to the eventual atrophy and the consequent weakening of the stalk attachment. In the ordinary course of events, the fruit would fall before the contents were nearly finished. To prevent this, the larvæ have evolved a very efficacious method: they tie the fruit on to the branch at the stalk. They come out at intervals from their retreat and weave silken ropes all over the stalk and the surface of the fruit as well as on the neighbouring surface of the branch, repeating this again and again until the fixings become so strong that it requires quite an effort to tear the fruit away. Every larva attaches its particular fruit to the branch or twig in this manner and thus prevents it being shaken off by the wind or falling to the ground while still inhabited. If it did, it would quickly rot and the inside would become unserviceable as food; or ants and other enemies would invade the premises and make short work of the inhabitants. Of course, when the caterpillars come out to fix the fruit, they are always liable to be snapped up by a bird or lizard or something, so that it is a dangerous game for them; but it is not half as dangerous as if they were to fall to the ground in their houses or house to become a prey to many more pertinacious and probably more numerous enemies. This is not the only adaptation that these larvæ have developed in the course of by-gone ages either. The “shovel” at the end of the body is another. The inside of a fruit becomes very insanitary after a time, wet and damp and mouldy and extremely strong-smelling (anybody can testify to this who has bred the larvæ from “Ghela”, *Randia dumetorum*). As the sap accumulates from the wound, due to the biting of the larvæ, and gets mixed with the droppings, it becomes necessary to clean up and hence the shovel. It is used to push out the refuse from the interior and just fits the orifice which is always made of the requisite size for that purpose. The inside of a fully eaten fruit is as clean as a new pin, especially when the larva is full grown and about to change. It pupates inside the last fruit as a rule and a very general rule. The operation is rarely effected anywhere else. Before finally settling down to change, the larva spins a web across the orifice, and always a web with two holes at the sides and hinged on one side as well; it is quite opaque. The pupa is formed inside, attached by the tail and a body-band to the surface. The butterfly, upon emerging, runs to the hole, forces its way

under the edge of the web—the edge that has been left unfastened by the larva for that purpose—and runs out to find a place from which to hang and develop its wings. Ants are hardly ever found with the larvæ and the few that were observed had probably other things in view than to visit them—the sugary, fermented juices of the inside of the fruit for example. The fruits the larvæ have been found in are various :—*Randia dumetorum* (*Rubiaceæ*); *Eriobotria japonica* (*Rosaceæ*); *Psidium guava* (*Myrtaceæ*); *Tamarindus indica* (*Leguminosæ*); *Strychnos nux-vomica* (*Loganiaceæ*); *Gardenia latifolia* (*Rubiaceæ*). It is evident, from this list, that they feed upon any species handy. The pupa is so attached inside the fruit that its head is directed towards the opening. It is stated by Downes that “we may notice an interesting fact, namely that the insect has the precautionary instinct, which acts as a second inducement, to make the aperture in the fruit in that stage of its existence in which it is furnished with organs best adapted for that purpose; for, had the larva omitted taking this step, the consequences would have been that the insect, when come to the butterfly state, would have been a prisoner totally unable to escape, being unprovided with any instrument suited to the purpose.” But it does not; it makes the aperture and enlarges it as found necessary all through its existence for egress and ingress so as to be able to come out and fix the stalk: after a time that is, after it has passed through, say, the first two stages. The larvæ in confinement will leave any fruit to which there is want of access of air because of the fermentation and consequent smell which must be exceptionally bad. Also, in confinement, they may not be able to shovel out the dirt owing, perhaps, to the hole not being uppermost and free—no wonder they then quit. Ants take away the droppings for some purpose or other but the larva does the cleaning itself, independently of their help. The shovel is very often used to block up the opening—to prevent enemies from gaining ingress very probably; though this device is not always resorted to.

The butterfly itself is a strong, powerful flier and takes quite long flights on occasion as when in pursuit of another one—a practice it is much prone to when basking on the tops of trees in the sun. It sits there expectant of sport—and gets it. It is one of the “basking butterflies” that is always to be found on the tops of the trees on the summit of the 2,000' high hill near the coast at Karwar in Kanara; and it appears at about 2 p.m. in the monsoon months—all butterflies have their particular time of day for putting in an appearance. Once known, their sequence is as good as a watch up there. The females are never seen on the hills-tops and do not bask. They may be found ovipositing however round the food plants. The insects are very difficult to catch in a net because



of their swiftness and high-flying habits; they are, also, so strong that they batter themselves to pieces before one can get hold of them. To illustrate the strength of the larval jaws E. H. Aitken remarks *a propos* of *V. perse*—and it is apposite here—that “the stony hardness of the fruit turns the edge of one’s penknife and one’s curiosity too.” Also, in alluding to the strength of the fastening of the fruits to the branches he says “I have taken a pomegranate infested with these larvæ (several usually inhabit each fruit) and made it stand in an egg-cup. In the morning it was so securely fastened that in taking up the fruit I lifted the cup.”

*Virachola isocrates* inhabits the whole of India, Burma and Ceylon except the desert tracts. It is commoner in the open country, with moderate rainfall of say about 20" where scrub jungle is the best forest available, than in heavy forest country with a large rainfall; it is commoner in the Bijapur District than in Kanara in the Bombay Presidency. It is also, in the latter District, more plentiful on the uplands at 2000' than on the sea-coast.

The figures 54 and 54*a* of the male and female on Plate H Vol. XXVI are fair; the male shows too little purple on the upperside; the female upperside is too light. Both are too pink.

(To be continued.)

# THE PAST AND PRESENT DISTRIBUTION OF THE LION IN SOUTH EASTERN ASIA

BY

N. B. KINNEAR.

From the popular point of view one of the, if not the, most interesting animals found in India is the lion and to many, who are not members of the Society and have not read Colonel Fenton's papers in the Journal, it may come as a surprise to hear that the lion does occur in this country though, it is true, in very small numbers and in a restricted area.

Dr. Blanford, in his volume on the Mammalia in the Fauna of British India series, gives a good account of the present and former distribution of the lion in India, but as that work is now out of print and not easy to obtain, I propose in the present paper to trace as far as possible the history of the lion in this country. At the same time a number of notes have been included on the lion in Persia, Mesopotamia and Asia Minor, which I have collected for some time. As it has not been possible to see the Asian, certain numbers of the Oriental Sporting Magazine and several of the other old Indian sporting magazines, a number of records have probably been missed and in the same way some records from books of travel referring to Mesopotamia, Persia and Asia Minor have also not been seen.

In the various cave and river deposits throughout Europe the remains of what is called the cave lion, *Felis spelæa*, have been found and by many authorities this animal is considered to have been identical with the lion of the present day or, at the most, a race. The deposits in which these remains are found belong to the Pleistocene.

Dr. A. B. Meyer in his paper on "The Antiquity of the Lion in Greece", which was reproduced in the Annual Report of the Smithsonian Institute in 1903, summarises what has been written on the lion being found in south east Europe and Asia Minor by various authorities, and his conclusions are that, within historic times, lions were found in Greece, if not also in the Balkans and the valley of the Danube. According to Herodotus the baggage camels of Xenophon were attacked by lions in the country of the Pæonians in Macedonia, this was roughly about 355 B. C. so that at that time most of Asia Minor and Syria were included within the range of the lion. Also we know that in Biblical times lions were found in Palestine, but according to Canon Tristram they appear to have become extinct about the time of the Crusaders, the last mention of them being by writers of the 12th century, when the lion still existed near Samaria.

We may take it then that during the 12th century, the lion roamed over parts of Syria, along the banks of the Euphrates and Tigris, parts of Arabia, the south western corner of Persia and northern India, through the Punjab, Sind, as far east as Palamau and south to the Nerbudda. There is no evidence of the lion being found in Afghanistan or Baluchistan nor have I been able to find any record of its occurrence in southern Arabia.

Coming now to actual records it is proposed to trace the history of the lion in S. E. Asia down to the present day and for the sake of convenience this will be arranged under the two headings (1) Syria, Mesopotamia and Persia, and (2) India.

## (1) SYRIA, MESOPOTAMIA AND PERSIA.

Rich, in his "Narrative of a Residence in Koordistan" published in 1836 and dealing with the years 1820-21, mentions that a part of the Tigris called Jat was famous for lions, but apparently he did not see or hear any



there, though at the junction of the Hye and the Tigris he saw some Arabs carrying a bier containing the mangled remains of a young child which had been killed by a lion. Lower down, below Kut, he heard lions roaring at night, but did not actually see any.

Colonel Chesney, the leader of the Euphrates Expedition, which was to prove the practicability of the Euphrates as a quick mail route to England, made his first visit to Mesopotamia in 1830, to carry out a hurried survey of the Euphrates and the Tigris. In his account of this expedition he mentions that near Gobain Island, on the well wooded banks of the Euphrates above Hit, he saw a lion on the bank within eight yards of his boat, and higher up at El Werdi he heard lions roaring at night.

The Euphrates Expedition took place in 1835-36, but no lions appear to have been seen on the voyage down the river, and Ainsworth, writing after 1850 (Personal Narrative of the Euphrates Expedition), says that "it is remarkable that the last two mentioned explorers (Loftus and Layard) saw many lions during their excavations of the mounds in the central parts of Khaldeæa, whilst we met with none during the navigation of the river," and later on he remarks that "the jungle of the Karun is reputed to be infested with lions, but we never saw one."

On the completion of the expedition down the Euphrates, the steamer "Euphrates" was taken up the Tigris, and at Bagdad Ainsworth tells us that he saw a tame lion sitting in a kufa with its owner. He also mentions that near Kut the natives spoke in terror of the lion, but that though he always went on shore, when the steamer was tied up for woodcutting, the only large carnivora he saw was a cheeta.

Assistant Surgeon Winchester, who was on the same trip, seems to have been more fortunate in seeing lions and he writes (Memoir on the River Euphrates, etc., during the late Expedition of H. C. armed steamer "Euphrates" Rec. Bomb. Geog. Soc., Nov. 1838) that below Ctesiphon, where the tamarisk was very thick on the river banks, he saw about sunset, three lions basking on the river's edge. The lions were fired at, but the shooting was bad and "so independent were they" notes Winchester that "they did not move!"

The next author to mention lions is Layard, the famous explorer of the ruins of Nineveh. He not only came across many lions, but also hunted them with the friendly Bakhtiyari chiefs in Arabistan, of which he gives interesting accounts, but of that more later.

In 1840, on his first visit to Mesopotamia, he mentions that while they were encamped on the desert side of the Tigris, near Mosul, they lit fires to keep off the lions "which are occasionally found there in the jungle in this part of Mesopotamia", and at Tekrit his raftsmen would not stop during the night "for fear of marauders and thieves and also he averred lions, which are occasionally, but very rarely, found so far north on the banks of the Tigris" (Autobiography, vol. 1).

In 1841 Layard saw a lion which had done much damage in the plain of Ram Hormuz and had eventually been killed by a detachment of the Luristan regiment. "It was unusually large and of very dark brown colour in some parts of its body almost approaching black." He goes on to say that "The lion has not, I believe, been known to traverse the high chain of the Luristan mountains into the valleys of the Persian side.\* In the plains of Khuzistan its usual places of concealment are the brush-wood and jungle on the banks of the rivers and streams and in the rice fields." (Early Adventures). On the desolate hills near Mt. Asemari

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\* Layard apparently meant north of the Bhaktiyari mountains, since at this time lions certainly occurred round Shiraz.

in Khuzistan Layard says that besides wolves, lions, leopards, bears, hyænas, jackals and other beasts of prey, various species of wild sheep and goats are found in great numbers, and while living with the Bakhtiyari near there he was present at a number of lion hunts. Of one of these he writes "One afternoon when Mehemet Taki Khan was seated at the doorway of his castle with the elders, a man arrived breathless and in great excitement, declaring that in crossing the plain he had met with a lion in his path. The beast, he said, was preparing to spring upon him, when he conjured it in the name of Ali to spare a poor unarmed man, who never harmed any of his kin. Thereupon the lion being a good Musalman and a Shia to boot, as some lions are believed to be, turned away and disappeared amongst the bushes. The man, ungrateful to the lion, offered to conduct Mehemet Taki Khan to the spot....". Layard then goes on to say how the man took them to a hollow covered with brushwood, where he said the lion was and on its being disturbed it sprang out at one of the chief's followers, who wounded it with his long gun but did not kill it. The lion then seized another follower and in doing so knocked down a third. The situation, as can be imagined, was most critical and Layard gives a delightful account of how the lion was killed. "Mehemet Taki Khan himself" he says "jumped off his horse, and advancing towards the beast addressed it thus in a loud voice: "O lion, these are not fit antagonists for thee. If thou desired to meet an enemy worthy of thee contend with me." The lion did not however appear to think that the chief was better than any of the rest and did not let go of its prey, so "the chief approached it and drawing the long pistol which he carried in his girdle, fired at its head and the lion falling on the ground was quickly despatched by the guns and swords of his, Mehemet Taki Khan's, followers." This lion was an unusually large one and had a short black mane.

As a rule, Layard tells us, these lions seldom attack human beings, but once, while on a hunting expedition, one of the party was carried off in the night. They were sleeping in the open and the man was not missed till, next morning, his remains were found close by! In the plain of Ram Hormuz, the flocks and herds of sheep and oxen belonging to the Bakhtiyari suffered from the depredations of lions. On account of this, Layard tells us, the Bakhtiyari used to place male buffaloes on the outskirts of their encampments, since "It is said that the buffalo does not fear a lion, and will even drive it away."

Between the years 1848 and 1849 Layard was at Nineveh and in his book "Nineveh and Babylon" he writes "The lion as I have observed is now rarely found on the banks of the Tigris as far north as Mosul, or even above Bagdad. That it was originally an inhabitant, there can be no doubt. From the earliest period it was considered the noblest of game, and was included amongst the wild beasts preserved in the paradises, or parks, attached to the royal palaces. On the monuments of Nineveh, the triumphs of the King are deemed no less worthy of record than his victory over his enemies."

Of the distribution of the lion in Mesopotamia as a whole, Layard in the abovementioned book says "The lion is frequently met with on the banks of the Tigris below Bagdad, rarely above. On the Euphrates it has been seen, I believe, almost as high as Bir, where the steamers of the first Euphrates Expedition under Col. Chesney were launched. On the Sinjar, and on the banks of the Khabour, they are frequently caught by Arabs. They abound in Khuzistan, the ancient Susiana. I have frequently seen three or four together and have hunted them with the chiefs of the tribes inhabiting that province."



When making excavations at Niffer near Karna, Layard frequently saw lions and he says that "The Midian Arabs boast of capturing them in the following manner, and trustworthy persons assure me that they have seen the feat performed. A man, having bound his right arm with strips of tamarisk, and holding in his hand a short piece of the same wood, about a foot or more in length, hardened in the fire and sharpened at both ends, will advance into the animals lair. When the animal springs upon him, he forces the wood into the animals extended jaws, which will then be held open whilst he can dispatch the astonished beast at his leisure with the pistol he holds in his left hand."

The Bedouins and Jebours, in Layard's time, used frequently to find lion cubs in the spring at Khabour and at Hillah. On his first visit to the last mentioned place Layard was presented with a pair of lions by Osman Pasha. These two lions appear to have been very tame and were allowed the run of the town, in the same way as sacred cows are allowed in this country. As the behaviour of these lions is rather amusing, I give Layard's description in full. "One was nearly of full size, and was well known in the bazaars and thoroughfares of Hillah, through which he was allowed to wander unrestrained. The inhabitants could accuse him of no other objectionable habit than that of taking possession of the stalls of the butchers, who, on his approach made a hasty retreat leaving him in undisturbed possession of their stores, until he had satisfied his hunger and departed. He would also wait the coming of the large kufias, or wicker boats of the fishermen and driving away the owners help himself to a kind of a large barbel, of which he appeared to have a decided relish. When no longer hungry he would stretch himself in the sun, and allow the Arab boys to take such liberties with him as in their mischief they might devise. He was taller and larger than a St. Bernard dog, and, like the lion found generally on the banks of the rivers of Mesopotamia, was without the dark and shaggy mane of the African species. The other lion was a cub, and had recently been found by an Arab in the Hindeyah Marshes."

Loftus, who travelled in Chaldea and Susiana about 1849-50, while encamped near Sinkara killed two lion cubs and frequently heard lions roaring. He also says that at this date lions were to be found at Susa near Dizful in Khuzistan. (*Travels and Researches in Chaldea and Susiana.*)

The lion existed in Upper Mesopotamia to a much later date than any already given, and in the Proceedings of the Zoological Society for 1880 Durnford writes that "Sheik Muslapha also informed him that five years ago a lion appeared near Biledjik\* and after destroying many horses was done to death." In 1885 Cannon Tristram in his "Fauna and Flora of Palestine" says "the latest trace being that a few years ago the carcass of one was brought into Damascus" adding that "it is still common in Mesopotamia though rare in India." Still later Sir Alfred Pease, in his "Book of the Lion," published three years ago, remarks on the status of the lion in Upper Mesopotamia as follows: "I find in my notes on the Fauna of Asia Minor made during a journey in 1891, the following:—The lion is no longer found in Asia Minor, but exists in Mesopotamia and Arabistan, between Pœlis, west of Aleppo, and Deyr, and in the Euphrates valley, where it frequents impenetrable thickets growing in places along the banks and in the islands in the river; it is also found in the lower part of the Karun river but is nowhere plentiful." Unfortunately there is nothing to show how this information was obtained and whether it was from direct occurrences or simply what the Arabs reported.

\* This is probably Biredjic, of the Times atlas, on the Euphrates north east of Aleppo.

Sir Oliver St. John, in Blanford's *Eastern Persia*, volume 2, which was published in 1876, writes that lions "are very numerous in the reedy swamps bordering the Tigris and Euphrates and are also found in the plains of Susiana, the modern Khuzistan." At this date too, they were also common in the country south of Shiraz as far east as longitude 53, but how far north the lion existed, St. John was unable to say, though he had definite information that they were not found north or west of Kerman-shah\*. In a certain valley west of Shiraz four or five adult lions used to be killed every year, which shows that in Sir Oliver St. John's time they must have been pretty common.

Mr. Robertson, H. B. M. Consul at Busra, informed Sir Victor Brook in 1875, that lions were then plentiful on the Karun, and Dr. Morit, writing on the *Geology and Ethnology of Lower Mesopotamia*, mentions that in 1888 lions were still numerous.

About 1907 or 1909, Sultan Abdul Hamed presented to the Berlin Zoological Gardens a full grown lion from Mesopotamia, but whether or not it came from Mesopotamia proper is not mentioned. This appears to be the last record for Mesopotamia, but in the adjoining country of Persia Sir Percy Sykes tells us that in 1900† the hills around Kazerun between Bushire and Shiraz were full of game "notably the maneless lion, which haunt this locality," and ten years later‡ he wrote "lions still exist along the banks of the rivers in Arabistan, but in very small numbers, I once saw a dead one floating down the Karun being eaten by sharks." Apparently this is the last authentic record of the lion in Mesopotamia, since Hubbard in his book "*From the Gulf to Arat*," published in 1916, says that on "the Karun it is now ten years or more since the last lion was seen in this part of the world." Whether a few stragglers still exist in the country between the Karun and Amara or near Kharbour remains to be seen, but so far no member of the Expeditionary Force§ has been able to give any definite information as to whether any are still to be found though many have been asked.

#### INDIA.

*India.*—There is no evidence to show that the lion inhabited Afghanistan or Baluchistan within historic times, but it was formerly found in Sind,|| Bahawalpur and the Punjab, becoming extinct round Hariana, in

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\* Dr. A. B. Meyer in "*The Antiquity of the Lion in Greece*" mentions Khaurism as a locality in which the lion was found. This is on the strength of a statement in a book called "*A Narrative of a Journey from Herat to Khiva, Moscow and St. Petersburg*" by Abbott.

The book was published in 1843 and in the appendix at the end of volume two the lion is mentioned, along with the tiger, leopard and bear, as occurring in Khaurism, now spelt Khorassan, the country between the Caspian and Afghanistan. No other traveller as far as I have been able to find out, confirms this statement.

† Ten thousand miles in Persia, 1900, p. 319.

‡ *The Field*, 1910, p. 625.

§ In an official publication on Mesopotamia published in 1916 it is stated that a few lions may be met with near Kharbour and on the borders of Persia.

|| Blanford, F.B.I. *Mammalia*, includes Khandesh within the range, but according to the *Bombay Gazetteer* for Khandesh, published in 1880, this is not certain and in a footnote it is stated that "whether lions were formerly found in Khandesh seems doubtful." Reference is made to an article which appeared in the *Oriental Sporting Magazine* on "Lion Hunting in Khandesh," but, as it is pointed out, this article refers to Guzerat and not to Khandesh. Lions certainly have not been found in Khandesh since 1818, as special enquiries have been made, and there would seem to be no record of lion shooting in Khandesh since the beginning of British rule."



the latter province, in 1842. It was however extinct in Sind before that date and the last on record was shot near Kot Deji in 1810. Exactly how far eastwards the lion was a regular inhabitant we do not know, though there is a statement of one being killed in the Palamaw district, Behar and Orissa, in 1814, but whether this was merely a straggler or not, there is no evidence to show. The southernmost limit appears to have been the Narbada. In 1832 one was killed at Baroda, while further north it was comparatively common round Ahmedabad in 1836. Central India in these early days was one of the strongholds of the lion and to give an idea of its numbers we may mention that Lydekker was informed that during the Mutiny, Colonel George Acland Smith killed upwards of 300 Indian lions and out of this number 50 were accounted for in the Delhi district!

The occurrence of the lion in Cutch is doubtfully recorded. The lion probably was found in Cutch at one time but the records are not satisfactory. Lt. Dodd mentions that Burns about 1830 wrote that lions as well as tigers, bears and wolves were found north of Bhooj, but that none except the last named were now found, though a solitary lion was shot near Bela on the Runn, which was supposed to have been a straggler from Guzerat.

Edward Blyth, the curator of the Royal Asiatic Society of Bengal, in his catalogue of the mammals in the collection, which was published in 1863, wrote that the "lion was extirpated in Hurriana about 1842, a female was killed at Rhyl in Damoh district Saugor and Nerbudda territories, so late as the cold season of 1847-48, and about the same time a few still remain in the valley of the Sind river in Kotah, C. I. The species would appear to be now extinct in that district."

A few years later writing in the *Oriental Sporting Magazine*, Blyth drew attention to some more recent records of the lion, which he said must have come as a surprise to sportsmen and naturalists, as it was thought that they had been long exterminated in these localities.

These two records consisted of one from Deesa, where Lt. Clarke of the Royal Artillery was badly mauled by a lioness in March 1864 and lost his arm, and near Gwalior, where three officers out shooting in March of the following year came suddenly on three lions, two of which they secured. Blyth seems to have missed certain records, for in 1863 Col. Martin of the Central Indian Horse, and Mr. Beadon, the Deputy Commissioner, saw and killed no less than eight lions at Patulghar, 70 miles north-west of Goona while in 1864 Mr. Arratoon of the police "shot at and wounded a lion near Sheorajpur (25 miles west of Allahabad) and eventually with native help stoned him to death as he had no spare ammunition." In 1865 Blanford tells us that Messrs. Lovell and Kelsay, of the railway staff at Jubbulpore, shot a lion in Rewah near the 80th milestone on the railway from Allahabad to Jubbulpore, and in the same year no less than nine lions were shot by one party in the neighbourhood of Kotah, Rajputana.

Round Goona lions were still numerous and two or three were shot in 1867, and Blanford, writing in the *Journal of the Asiatic Society of Bengal* for that year, says "a few appear to be killed about Gwalior and Goona, but the animal is scarce." At the end of his article he summarized the distribution of the lion in India at that date as follows:—"The lion seems still to exist in three isolated parts of central and western India, omitting its occasional occurrence in Bundelkund. These are (1) from near Gwalior to Kotah, (2) around Deesa and Mt. Abu and thence southwards nearly to Ahmedabad and (3) in part of Kathiawar, in the jungles known as the Ghur."

On Waterloo day, 1872, Sir Montagu Gerard killed a lion on Cheen Hill, nine miles from Goona, and the last one in Central India proper

appears to have been that mentioned by Selater as having been killed by Col. Hall near Goona in the following year.

In Rajputana they became extinct about the same date and in the Gazetteer of the "Western Rajputana States Residency and Jodhpur Residency" we find that a full grown female lion was killed on the Anandra side of Abu by a Bhil shikari in 1872, and in Jodhpur "the last four" are stated "to have been shot near Jaswantpura about 1872."

Lydekker gives 1888 as the date the last lions was killed in Guzerat exclusive of Kathiawar, but the last record I have been able to find is that mentioned by Colonel Nurse in the Society's Journal, volume XIII, 1900, in which he says "the last, I believe, killed in 1878 near the village of Bhoyen, about two miles from Deesa." According to the Gazetteer for Palanpur the lion was "now very rare" there in 1880.

The lion is still found in small numbers in the Native State of Junaghad in Kathiawar, where they are principally found in the Gir forest, but occasionally lions stray over the border into neighbouring states, where it is not long before they are shot.

For information in regard to the present position of the lion in Junaghad reference can be made to Colonel Fenton's two papers in the Society's Journal, Volumes XIX and XX, and Mr. Crump's notes in the Mammal Survey Report for Kathiawar in Volume XXII.

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THE FLORA OF THE INDIAN DESERT.  
(JODHPUR AND JAISALMER).

BY

E. BLATTER, S.J., AND PROF. F. HALLBERG.

PART V.

(Continued from page 987 of Vol. XXVI.)

1. STATISTICAL NOTES.

We give in the first place a tabulated list of the orders represented in the Rajputana Desert, together with their respective genera and species, indigenous as well as introduced:—

Order.	Genera.		Total of Genera.	Species.		Total of Species.
	Indige- nous.	Intro- duced.		Indige- nous.	Intro- duced.	
Menispermaceæ .	1	..	1	2	..	2
Nymphaeaceæ ..	1	..	1	1	..	1
Papaveraceæ ..	..	2	2	..	2	2
Cruciferae ..	1	2	3	2	3	5
Capparidaceæ ..	4	..	4	8	..	8
Violaceæ ..	1	..	1	1	..	1
Polygalaceæ ..	1	..	1	2	..	2
Caryophyllaceæ..	2	..	2	2	..	2
Portulacaceæ ..	1	..	1	2	..	2
Tamaricaceæ ..	1	..	1	3	..	3
Elatinaceæ ..	1	..	1	3	..	3
Malvaceæ ..	4	1	5	12	4	16
Sterculiaceæ ..	1	..	1	4	..	4
Tiliaceæ ..	2	..	2	10	..	10
Linaceæ ..	..	1	1	..	1	1
Zygophyllaceæ .	5	..	5	6	..	6
Geraniaceæ ..	4	..	4	5	..	5
Rutaceæ ..	..	1	1	..	2	2
Burseraceæ ..	2	..	2	3	..	3
Meliaceæ ..	..	1	1	..	1	1
Celastraceæ ..	1	..	1	1	..	1
Rhamnaceæ ..	1	..	1	5	..	5
Vitaceæ ..	..	1	1	..	1	1
Sapindaceæ ..	1	..	1	1	..	1
Anacardiaceæ ..	1	1	2	1	1	2

Order.	Genera.		Total of Genera.	Species.		Total of Species.
	Indige- nous.	Intro- duced.		Indige- nous.	Intro- duced.	
Moringaceæ ..	1	..	1	1	1	2
Leguminosæ ..	21	10	31	47	13	60
Rosaceæ ..	1	..	1	1	..	1
Combretaceæ ..	1	..	1	4	..	4
Myrtaceæ ..	..	3	3	..	3	3
Lythraceæ ..	1	2	3	3	2	5
Saxifragaceæ ..	1	..	1	1	..	1
Onagraceæ ..	1	..	1	1	..	1
Cucurbitaceæ ..	8	1	9	14	3	17
Cactaceæ ..	..	1	1	..	1	1
Ficoideæ ..	5	..	5	10	..	10
Umbelliferæ ..	..	1	1	..	1	1
Rubiaceæ ..	3	..	3	4	..	4
Compositæ ..	28	3	31	33	3	36
Oleaceæ ..	..	1	1	..	1	1
Salvadoraceæ ..	1	..	1	2	..	2
Apocynaceæ ..	1	2	3	1	2	3
Asclepiadaceæ ..	9	..	9	9	..	9
Gentianaceæ ..	3	..	3	3	..	3
Boraginaceæ ..	6	..	6	15	..	15
Convolvulaceæ ..	9	..	9	21	1	22
Solanaceæ ..	7	..	7	9	6	15
Scrophulariaceæ ..	7	..	7	9	..	9
Orobanchaceæ ..	1	..	1	1	..	1
Bignoniaceæ ..	1	..	1	1	..	1
Pedaliaceæ ..	..	1	1	..	1	1
Acanthaceæ ..	7	..	7	12	..	12
Verbenaceæ ..	4	..	4	4	..	4
Labiataæ ..	3	..	3	9	1	10
Nyctaginaceæ ..	1	..	1	3	..	3
Amarantaceæ ..	8	1	9	17	1	18
Chenopodiaceæ ..	5	..	5	7	..	7
Polygonaceæ ..	2	1	3	3	1	4
Aristolochiaceæ ..	1	..	1	1	..	1
Lauraceæ ..	1	..	1	1	..	1
Euphorbiaceæ ..	2	1	3	13	1	14
Urticaceæ ..	..	3	3	..	5	5
Gnetaceæ ..	1	..	1	1	..	1
Hydrocharitaceæ ..	1	..	1	1	..	1
Liliaceæ ..	3	2	5	3	2	5
Commelinaceæ ..	2	..	2	4	..	4
Naiadaceæ ..	2	..	2	6	..	6
Cyperaceæ ..	6	..	6	26	..	26
Gramineæ ..	25	3	28	65	3	68
Orders 69 (58 in- digenous) ..	226	46	272	440	67	507



As can be seen in the above list there are 69 orders, 272 genera and 507 species. Of these are indigenous : 58 orders, 226 genera and 440 species. From now we shall confine ourselves to the indigenous plants only.

The following are the 10 dominant orders :—

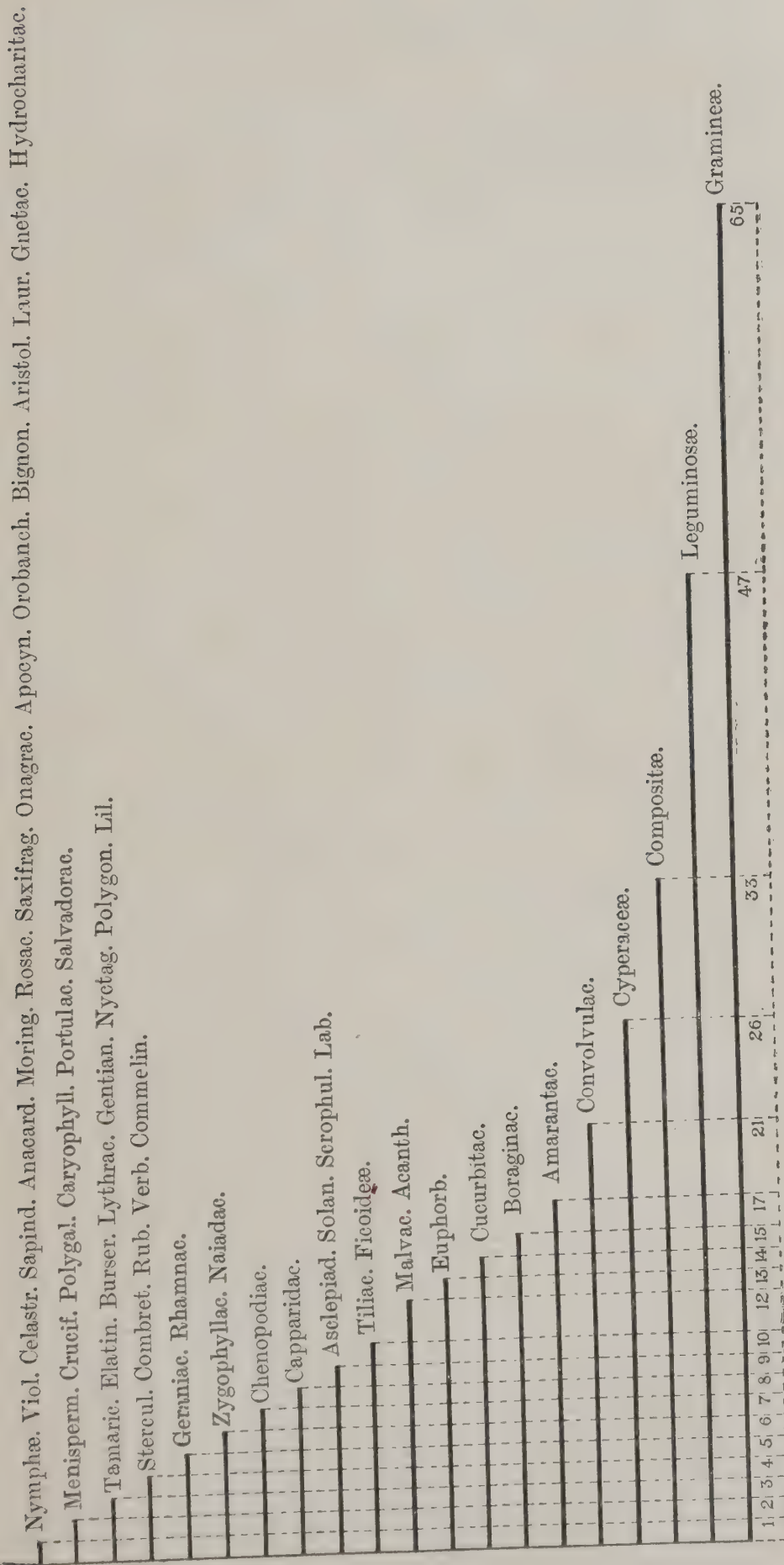
1.	Gramineæ	with 65 species in 25 genera.			
2.	Leguminosæ	„ 47	„	„ 21	„
3.	Compositæ	„ 33	„	„ 28	„
4.	Cyperaceæ	„ 26	„	„ 6	„
5.	Convolvulaceæ	„ 21	„	„ 9	„
6.	Amarantaceæ	„ 17	„	„ 8	„
7.	Boraginaceæ	„ 15	„	„ 6	„
8.	Cucurbitaceæ	„ 14	„	„ 8	„
9.	Euphorbiaceæ	„ 13	„	„ 2	„
10.	{ Malvaceæ	„ 12	„	„ 4	,
	{ Acanthaceæ	„ 12	„	„ 7	„

In order to get a clearer insight into the relations of the flora of W. Rajputana with the neighbouring countries, we add a list of the 10 dominant orders of N. Gujarat, the Indus Plain region and the Gangetic Plain region. The fact that W. Rajputana itself belongs to the Indus Plain region cannot prevent us from instituting this comparison, as W. Rajputana was practically unknown from a botanical point of view when J. D. Hooker wrote his "Sketch of the Flora of British India."

<i>N. Gujarat*</i>	<i>Indus Plain Region**</i>	<i>Gangetic Region**</i>
1. Gramineæ.	1. Gramineæ.	1. Gramineæ.
2. Leguminosæ.	2. Leguminosæ.	2. Leguminosæ.
3. Cyperaceæ.	3. Compositæ.	3. Cyperaceæ.
4. Compositæ.	4. Cyperaceæ.	4. Compositæ.
5. Convolvulaceæ.	5. Scrophulariaceæ.	5. Scrophulariaceæ.
6. Euphorbiaceæ.	6. Labiatæ.	6. Malvaceæ.
7. Acanthaceæ.	7. Boraginaceæ.	7. Acanthaceæ.
8. Malvaceæ.	8. Malvaceæ.	8. Euphorbiaceæ.
9. Scrophulariaceæ.	9. Euphorbiaceæ.	9. Convolvulaceæ.
10. Amarantaceæ.	10. Convolvulaceæ.	10. Labiatæ.

\*Saxton and Sedgwick in Rec. Bot. Surv. Ind. VI (1918) 218.

\*\* Hooker, J. D., in Imper. Gazetteer, ed. 3.



To show how many species belong to each order.



A comparison of the Dicotyledons with the Monocotyledons shows the great poverty of the latter, whether we consider the orders, genera, or species :

	Or- ders.	Genera.		Total of Genera.	Species.		Total of Species.
		Indige- nous.	Intro- duced.		Indi- genous.	Intro- duced.	
Dicotyledons	63	187	41	228	335	62	397
Monocotyle- dons ..	6	39	5	44	105	5	110

If we take only the indigenous plants into account we find that the Dicotyledons make up 76·13 per cent., and the Monocotyledons 23·86 per cent. of the total, in other words, the ratio of Monocotyledons to Dicotyledons is 1 : 3·9.

The ratio of orders to genera and species is 1 : 3·9 : 7·3.

The proportion of genera to species is striking. In the whole of British India it is 1 : 7, in the Bombay Presidency (including Sind) it is 1 : 2·6, whilst in the Rajputana desert it is 1 : 1·99.

For the number of genera belonging to each order we refer to the following diagram which does not require any explanation :—

Number of genera.	Compositæ.	
		Gramineæ.
22		
25		
21		Leguminosæ.
9	Asclepiadaceæ, Convolvulaceæ.	
2	Cucurbitaceæ, Amarantaceæ.	
7	Solanaceæ, Scrophulariaceæ, Acanthaceæ.	
6	Boraginaceæ, Cyperaceæ.	
5	Zygophyllaceæ, Ficoideæ, Chenopodiaceæ.	
4	Capparidaceæ, Malvaceæ, Geraniaceæ, Verbenaceæ.	
3	Rubiaceæ, Gentianaceæ, Labiatæ, Liliaceæ.	
2	Caryophyllac. Tiliac. Burserac. Polygonac. Euphorbiac. Commelin. Naiad.	
1	Menisperm. Nymphaeac. Cruciferae. Violac. Polygalac. Portulac. Tamaric. Elatinac. Sterculiac. Celastrac. Rhannac. Sapind. Anacard. Moringac. Rosac. Combret. Lythrac. Saxifrag. Onagrac. Salvador. Apocynac. Orobanch. Bignon. Nyctag. Aristoloch. Laurac. Gnetac. Hydrocharit.	

To show the number of genera in each order.



Out of 440 indigenous species we have classified 406 according to their geographical distribution. 34 have not been considered on account of their abnormal and erratic distribution, which makes one doubt whether the plants have been accurately named and compared in all cases. These are the results of our classification arranged according to the greater or smaller number of species belonging to each division :

North African-Indian Desert	..	..	71
Indian .. .. .	..	..	67
Tropics of the Old World	..	..	46
Trop Afr. and N. Afr.-Ind. Desert	..	..	44
Tropical Africa	..	..	37
Oriental	..	..	28
Indo-Malayan	..	..	27
Tropics generally	..	..	26
All warm countries	..	..	25
Endemic	..	..	17
Mediterranean	..	..	9
Cosmopolitan	..	..	7
Temperate and subtropical regions	..	..	2

We can easily distinguish 3 well-marked elements in the flora of the Rajputana desert : A western, an eastern, and a more general element (including those which are purely Indian).

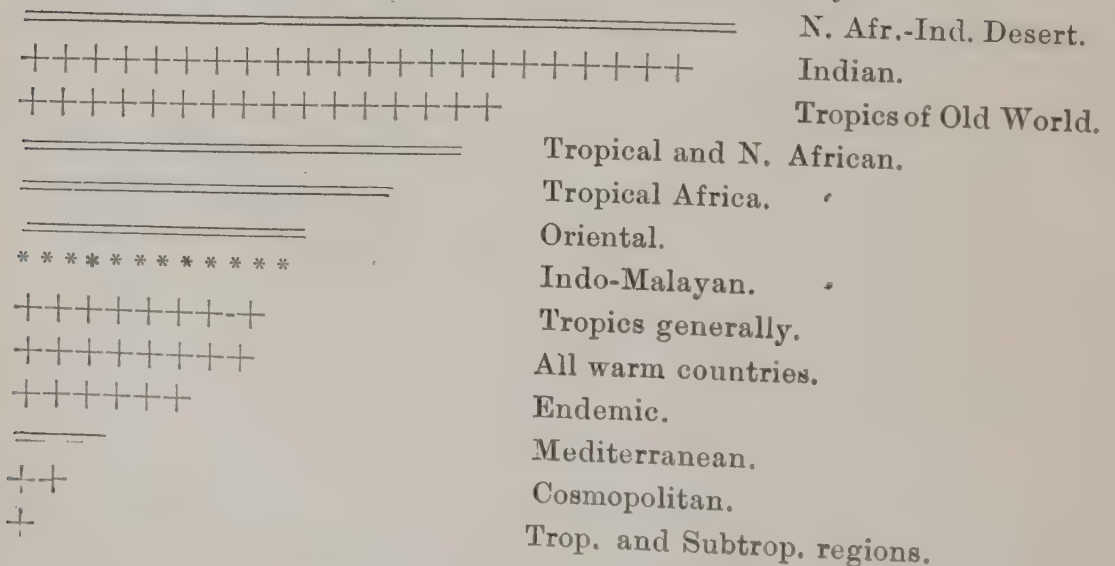
The following make up :—

The Western Element.    The Eastern Element.    The General Element.

N. Afr.-Ind. Desert	71	Indo-Malayan	27	Indian	67
Trop. and N. Afr.	44			Trop. of Old World	46
Trop. African	37			Tropics generally	26
Oriental	28			All warm countries	25
Mediterranean	9			Endemic	17
				Cosmopolitan	7
Total	..	189		27 Temp. and subtrop. reg.	2

190

The following diagram gives the same data graphically :—



Explanation : {

\*\*\*\*\* Western element.

\*\*\*\*\* Eastern element.

+++++ The rest.

The general element can be neglected for our purpose, as it consists of species which are either only Indian or show a wider distribution over the Eastern and Western parts of the Old World, or comprise even certain regions of the whole globe.

What is left to form an estimate of the plant-geographical position of the flora is the western element with 189 species, and the eastern (here Indo-Malayan) element with 27 species. The eastern forms just 1/7 of the western. These numbers indicate that the Indo-Malayan and western botanical regions meet in the Western Rajputana desert. The ecological conditions of the country are not such as to exclude Indo-Malayan types entirely, but the western element is preponderant. This proves that Drude was correct, when he drew the line of demarcation between the Indo-Malayan flora and the Perso-Arabian region from the Gulf of Cambay northwards along the Aravallis.

We have said that there are 17 endemic species. We mention their names, as they are new to systematic botany :

- Farsetia macrantha*, Blatt. and Hall. (*Cruciferae*).
- Melhania magnifolia*, Blatt. and Hall. (*Sterculiaceae*).
- Zizyphus truncata*, Blatt. and Hall. (*Rhamnaceae*).
- Psoralia odorata*, Blatt. and Hall. (*Leguminosae*).
- Tephrosia multiflora*, Blatt. and Hall. (       ,,       )
- Tephrosia petrosa*, Blatt. and Hall. (       ,,       )
- Rhynchosia rhombifolia*, Blatt. and Hall. (       ,,       )
- Rhynchosia arenaria*, Blatt. and Hall. (       ,,       )
- Anogeissus rotundifolia*, Blatt. and Hall. (*Combretaceae*).
- Ammannia desertorum*, Blatt. and Hall. (*Lythraceae*).
- Pulicaria rajputanæ*, Blatt. and Hall. (*Compositae*).
- Glossocardia setosa*, Blatt. and Hall. (       ,,       )
- Convolvulus densiflorus*, Blatt. and Hall. (*Convolvulaceae*).
- Convolvulus gracilis*, Blatt. and Hall. (       ,,       )
- Ærua pseudo-tomentosa*, Blatt. and Hall. (*Amarantaceae*).
- Euphorbia jodhpurensis*, Blatt. and Hall. (*Euphorbiaceae*).

It is very likely that a better knowledge of the Cutch, Sind and Baluchistan floras will reduce the number of endemic species.

(To be continued.)



## INDIAN DRAGONFLIES,

BY

MAJOR F. C. FRASER, I.M.S.

(With Text-figures.)

(Continued from page 932 of Volume XXVI.)

## Part VII.

**64. *Rhyothemis plutonia*, Selys.**

Male and female much alike.

Male: Expanse 64 mm. Length 30 mm. Female: Expanse 54 mm. Length 28 mm.

Head: eyes reddish brown above, paler olivaceous beneath and at the sides; vesicle, frons and upper part of epistome metallic blue green; occiput blackish brown; lower part of epistome, labium and labrum brown.

Prothorax black.

Thorax and abdomen brown with a metallic green lustre. Legs brown.

Wings; both short, the fore narrow, the hind very broad, especially at the anal area; black or blackish brown by transmitted light but reflecting a dark, metallic green. In the male the metallic lustre is general throughout the wing but in the female is most marked at the base, especially in the fore part of loop. The apex of forewing in the male is hyaline, this area being very variable, from a mere spur at the extreme apex, to a wider area extending to within 1 or 2 cells of the stigma and running obliquely outwards and backwards. In the female both wing apices are hyaline, in the fore to just proximal of the stigma and in the hind to 1 cell distal of the stigma, its free border being here deeply concave. In the male, there is often a clearer triangular area just distal of the node more marked in the hindwing than in the fore.

Sexual organs as for the genus.

*Hab.* Burma, Bengal, Indo-Malay and Indo-China, Borneo.**65. *Rhyothemis triangularis*, Kirby.***Rhyothemis lankana*, Kirby.*Rhyothemis bipartita*, Selys.

Expanse 60 mm. Length 28 mm. Subject to slight variation in size.

Head: eyes reddish brown above, lilaceous at the sides and beneath; vesicle and forehead metallic green; face and labrum yellowish.

Prothorax brown.

Thorax and abdomen blackish with a metallic green lustre. Legs black.

Wings short and broad, the anal field of hindwing very broad. In both sexes hyaline, with the bases of all wings deep black, this part appearing dark metallic blue by reflected light. The hyaline part is suffused with a greyish brown which gradually deepens as traced towards the wing apices. The limits of the black basal marking in the forewing, up to the 2nd antenodal nervure and to the distal or proximal end of trigone; in the hind up to the 3rd antenodal nervure or in some specimens up to as far as the node. The outer border of the marking sharply defined and serrated or notched. The extent of the marking is extremely variable, Ceylon specimens usually being more extensively marked than those from South India. In an average specimen, the black extends to within 1 cell of the

node, 3 cells distal of the trigone and as far as the apex of the loop. Usually there are two, more or less clear, hyaline rays at the base of the hindwing.

Sexual organs as for genus.

*Hab.* South India, Coorg, Ceylon, Java, Borneo.

Genus—PANTALA.

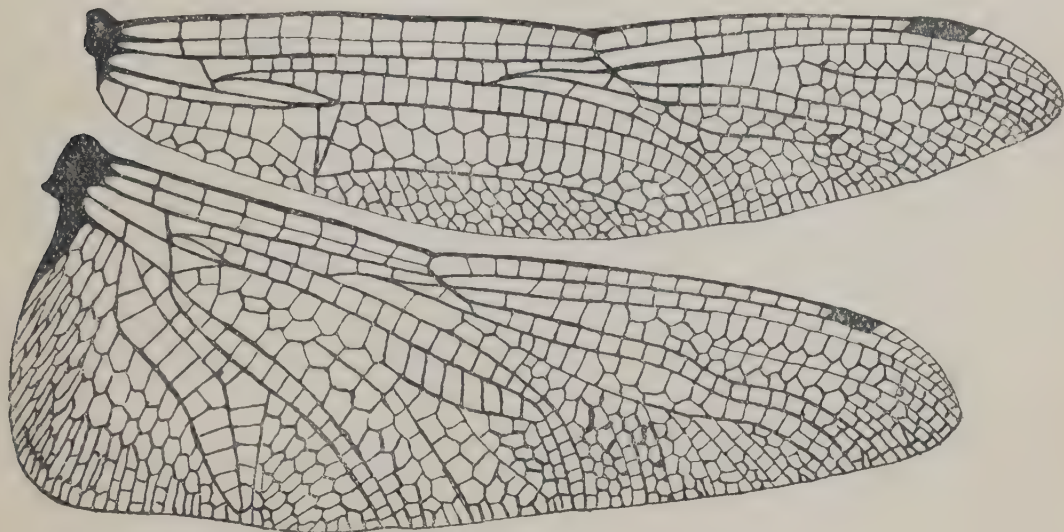


Fig. 53. Wings of *Pantala flavescens* showing neuration.

Genus *Pantala*, Fabr, 1861.

Head large and globular; eyes contiguous for a long distance; suture very deep and separating two flat areas which lie below the forehead, the latter narrow and prominent; vesicle broad and low.

Prothorax with a very small lobe which is almost entirely hidden by the approximation of head and thorax.

Thorax robust, very hairy. Legs slim and long; hind femora with about 25 small, evenly sized spines and some larger, wider-spaced ones in the outer third; mid femora with a row of gradually lengthening, larger spines. Tibial spines very long, moderately robust and numerous. Claw-hooks robust, situated about the middle. Armature of legs very similar in the female.

Abdomen cylindrical and appearing relatively short due to the depth of the hindwing, dilated at the base, constricted at the third segment and then gradually tapering to the end. Supplementary ridges on the 2nd, 3rd, 4th and 5th segments.

Wings long, the fore narrow, the hind very broad; reticulation close; trigone in forewing 2 or 3 cells distal to the line of trigone in hind; sectors of the arc with a moderately long fusion, about equal in the two wings; the arc lying between the 1st and 2nd antenodal nervures; antenodal nervures  $13\frac{1}{2}$ , the final one incomplete; 1 cubital nervure in the forewing, 2 in the hind, the distal of which lies near the trigone and forms a minute subtrigone; no supplementary nervures to the bridge; trigone in the forewing traversed once, very narrow, the costal side about  $\frac{1}{4}$ th the length of distal side, its relation to the hypertrigone a little more than a right angle; trigone in hindwing entire, its base very slightly proximal to the arc; 8th nervure in the hindwing from the anal angle of trigone, in the forewing nearly straight, so that the discoidal field is strongly contracted at the termen; discoidal field begins with 3 rows of cells for 4 or 5 rows and is then continued as rows of 4; 2 rows of cells between 5 and 5a; all hypertrigones entire; 4th nervure strongly undulated; 5th nervure



diverging from the 4th and tending to become lost in the general reticulation a short distance from the termen; the 7th nervure at the distal end of 7a, strongly approximated towards the 6th and bent abruptly towards the termen; loop long and narrow, made up of 2 rows of cells none of which are as a rule divided, its outer angle tending to become obliterated and its midrib to become straightened. The inner border with a strong angle from which a nervure descends and splits the anal area into a distinct outer zone of large cells and an inner one of narrow, elongated ones. Membrane moderately large. Stigma of forewing much larger than that of hind.

Anal appendages very long and slender, in close apposition.

Sexual organs: male: 2nd segment very small, the lamina projecting and deeply fissured so that it appears to be made up of 2 lobes: tentacule broad, depressed, the internal directed outwards, the external only present as a rudimentary ridge on the internal; lobe small, oval and depressed.

Female: borders of 8th segment not dilated; no distinct vulvar scale formed on the 8th ventral plate, the free border of which projects as a stunted, tongue-like process; 9th ventral plate short, carinated, near its middle 2 small, horn-like processes similar to those seen in *Rhyothemis*.

Anal appendages in the female as long as those of the male.

**66. *Pantala flavescens*, Fabr.**

*Libellula flavescens*, Fabr.

*Libellula viridula*, Palisot de Beauvais.

*Libellula analis*, Burm.

*Libellula terminalis*, Burm.

Male and female very similar. Expanse 85 mm. Length 48 mm.

Head rounded and relatively large; eyes capped with bright red or reddish brown, pale lilac blue at the sides and beneath; vesicle and occiput bright yellow or olivaceous; face and forehead bright yellow, often with a dash of bright red at the upper part of latter; labium and labrum dark yellow.

Prothorax ochreous.

Thorax variable in colour, usually olivaceous or golden brown but sometimes a reddish orange, especially in wet season forms which are more highly coloured. Laterally paler, bluish green or greenish white, no markings.

Abdomen ochreous or yellow, suffused with red along the dorsum and on the dorsum of the 8th, 9th and 10th segments, small black spots. Beneath the first four segments, bluish green or whitish, the remainder dark yellowish brown and all bearing lateral, black "f"-shaped marks.

Superior anal appendages very long, as long as segments 9 and 10, brownish or the basal part yellow.

The female is very similarly coloured but has no red on the face or abdomen and the eyes are olivaceous brown above. The abdomen is stouter and without the constriction at the 3rd segment.

Wings similar in the sexes but the basal spot paler and more diffuse in the female. Hyaline with a pale yellow, basal spot in the hindwing extending as far as the cubital nervure, inner border of the loop but not as a rule to the termen. Very often the apices of the wings are a little smoky. Stigma reddish brown. Membrane white. Legs ochreous streaked with black.

Sexual organs as for genus.

*Hab.* Throughout India. *P. flavescens* occupies in the dragonfly world the same position, which *Cynthia cardui* occupies in the lepidopterous, it being a very cosmopolitan insect and found throughout the warmer zones of the whole world.

In Indian limits it is usually found to be gregarious and a swarm of a hundred or more may often be seen dancing lazily in the air. They prefer open breezy situations and for no explicable reason, will often choose the

lee-side of a banyan tree bordering a hot, dusty highway. To such situations they appear to migrate from their breeding places which are usually to be found at no great distance off, these being generally shallow swamps or marshes.

Genus—TRAMEA.

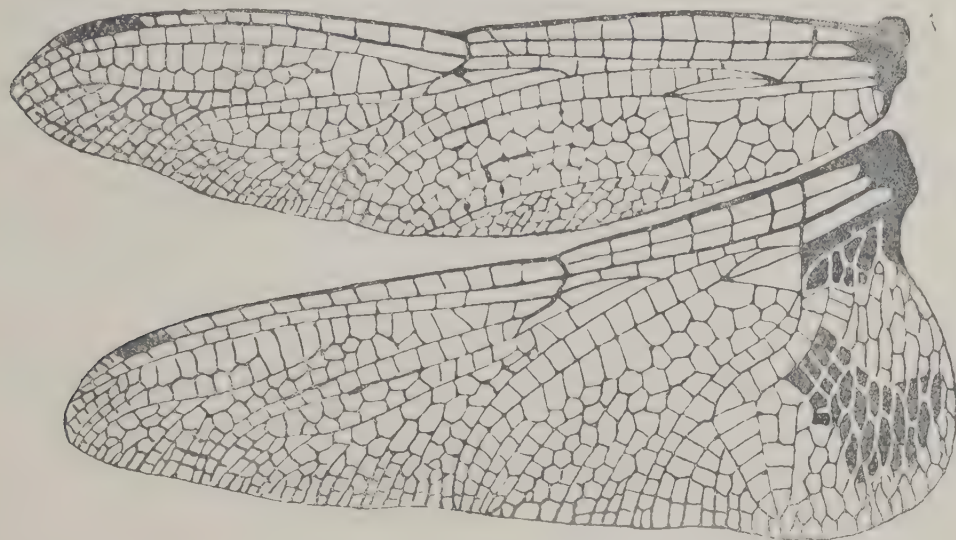


Fig. 54. Wings of *Tramea basilaris* to show neutration.

Genus *Tramea*, Hagen, 1861.

Head very large; eyes contiguous for a long distance, about equal to the length of occiput; vesicle large; forehead broad and prominent, but with no marked foreborder; suture flush.

Prothorax with a very small posterior lobe which is completely hidden beneath the head.

Thorax robust, cubical, very hairy, almost pilose. Legs very long and slim; the hind femora with a row of stout, widely-placed, gradually lengthening spines; mid femora similar; tibial spines robust, numerous; claw-hooks robust, situated near the apex. Armature in the female very similar.

Wings very long, the fore moderately and relatively narrow, the hind broad; reticulation close; trigone in the forewing 3 or 4 cells distal to the line of the trigone in the hind; sectors of arc fused for a long distance in the forewing and running close together for some distance, in the hind a much longer fusion; arc lying between the 1st and 2nd antenodal nervures; antenodal nervures  $10\frac{1}{2}$  to  $11\frac{1}{2}$ , the final incomplete; the distance between the first two antenodals is much greater than the following ones; 8th nervure in the forewing from the anal angle of trigone, very short and only a little convex, its outer end more or less lost in the general reticulation; the discoidal field on account of the shortness of the 8th nervure, but very slightly dilated at the termen, usually parallel-sided throughout its extent, 4 rows of discoidal cells; base of trigone in the hindwing at the arc; only 1 cubital nervure to all wings; no supplementary nervures to the bridge; trigone in the forewing extremely narrow and very long, usually traversed twice; trigone in the hindwing long and narrow, entire; all hypertrigones entire; subtrigone in forewing almost or quite square, with 6 or 7 cells, its outer angle more or less lost; 4th nervure straight, but the outer end bent abruptly towards the termen; 5a strongly concave, with 2 rows of cells between it and 5; a well-marked accessory nervure running, about midway between the 3rd and 4th nervures and parallel to both, but with a concavity towards



the 3rd ; loop very long and very narrow, its inner border with an angle very similar to that seen in *Pantala flavescens*, from which a tolerably distinct supplementary sector runs back to split up the anal area into an inner area of narrow, elongated cells arranged in oblique rows and an outer, of rounder, hexagonal cells. Divided cells in all angles of the loop ; body of loop narrow and strongly constricted, the toe much elongated. Stigma small, that of the hindwing much smaller than that of the fore. Membrane moderately large.

Abdomen long and narrow, cylindrical, the base tumid, the 3rd and 4th segments markedly constricted, the remainder fusiform in the male, cylindrical in the female.

Anal appendages very long and slender in both sexes.

Sexual organs : male : lamina broad and depressed, the border curling outward a little ; internal tentaculæ very robust, long, almost straight hooks, somewhat carrot-shaped ; external tentaculæ obsolete ; lobe quadrate, strongly arched posterior border.

Female : border of 8th segment not dilated ; 8th ventral plate prolonged into a split, vulvar scale ; 9th ventral prolonged into a tongue-like process overhanging the 10th and furnished at its middle with two small, horn-like processes similar to those seen in *Pantala*.

#### KEY TO SPECIES.

- A. Basal marking of hindwing a golden yellow enclosing a dark reddish brown, smaller mark .. .. . *T. basilaris burmeisteri*  
 B. Basal marking of hindwing a blackish brown without any surrounding zone of yellow .. *T. limbata*.
67. ***Tramea basilaris burmeisteri*, Kirby.**  
*Libellula chinensis*, Burm.  
*Libellula basilaris*, Hagen.

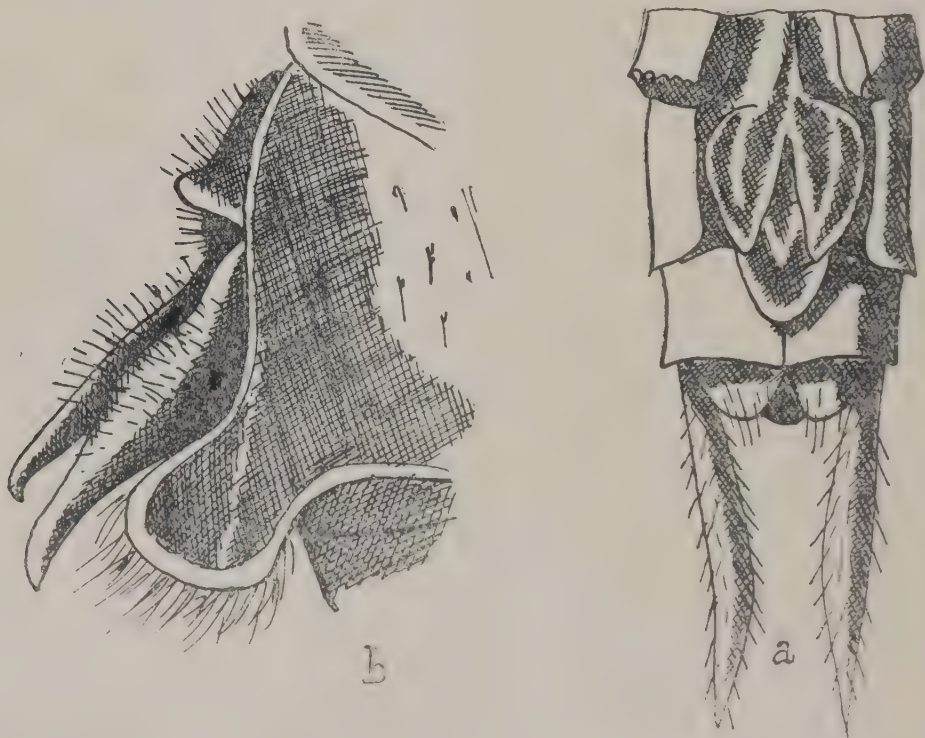


Fig. 55. Sexual organs of *Tramea basilaris burmeisteri*.  
 a. Female organs. b. Male organs. (x 12).

Expanse in both sexes 90 mm. Length 50 mm.

Male: head; eyes deep reddish brown above, lilaceous at the sides and beneath; vesicle yellow; occiput olivaceous; forehead brilliant crimson, with a fine, well-defined, black, basal line; bright red above, paler yellow below; labrum yellow; labium brownish.

Prothorax olivaceous yellow.

Thorax ochreous on the dorsum, where it is thickly covered with short, light brown hairs, paler at the sides and a bluish or yellowish green, marked with two oblique, black stripes placed close together and often confluent at their middles. A black humeral stripe often present, incomplete below or connected by a fine black line to the black on the under surface of the fore part of thorax.

Abdomen rust red, with black annules as far as the 6th, at the distal end of each segment. These annules widening laterally and occasionally incomplete on the dorsum; black spots on the dorsal surface of the 7th to 10th segments, each of these bearing a fine, clear white annule at its proximal border. Some specimens especially those caught during the rains, have the abdomen a brilliant red. Legs black, the armature brown.

Wings hyaline. A basal marking in the hindwings, consisting of a golden yellow background in which lie two, dark brown, irregular spots. The yellow area extending as far as the middle of trigone, nearly as far as the 2nd antenodal, as far as the midrib of loop and thence somewhat obliquely to the termen but not reaching the tornus or anal margin. The anterior brown spot begins in the cubital space and extends out to trigone and backwards for about one cell's breadth into loop; the posterior is separated from the anterior by about one cell's breadth and extends obliquely towards the tornus, being a little constricted at its middle. The nervures in this spot are golden yellow and contrast well with the dark ground colour. Antenodal nervures  $11\frac{1}{2}$ . Membrane white. Stigma mahogany red; that of the hindwing about two-thirds the size of the fore.

Female very similar to the male. Eyes and face without the red, olivaceous or yellowish, the cap of the eyes being brown. Thorax similar to the male. Abdomen, segments 2 to 7 light olive brown, with complete distal, black rings, the remaining segments blackish brown.

Basal marking in hindwing more extensive, the yellow extending as far as the 3rd antenodal and outer end of trigone.

Sexual organs as for genus.

*Hab.*—Throughout Continental India and extending into Thibet in the North, and to Ceylon southwards. Burma and Indo-Malay. This insect is usually found hovering over tanks in which it breeds or wandering in the near neighbourhood, generally ascending to great heights. On some days, during the rains in Bombay, the air is seen to be full of them, often in company with *pantala* whose flight they rival in gracefulness. I once took a male specimen of this insect about forty miles off the Kathiawar coast on board a liner so that it probably has strong migratory instincts.

#### 68. *Tramea limbata*, race *similata*, Rambur.

*Tramea limbata*, Kirby.

*Libellula limbata*, Desjardins.

*Libellula incerta*, Rambur.

*Tramea incerta*, Brauer.

*Libellula mauriciana*, Brauer.

*Libellula similata*, Rambur.

*Tramea similata*, Brauer.

*Libellula stylata*, Rambur.

*Tramea stylata*, Brauer.

*Tramea rosenbergi*, Brauer.

*Tramea transmarina*, Brauer.

*Tramea samoensis*, Brauer.

*Tramea eurybia*, Selys.

*Tramea euryale*, Selys.

*Tramea continentalis*, Selys.

*Tramea limbata continentalis*, Ris.

*Tramea translucida*, Kirby.

*Tramea madagascariensis*, Kirby.



From the long list of synonyms, it will be seen that *Tramea limbata* is the name applied to a series of insects, differing but slightly and all tending to merge the one into the other. His remarks that they are all probably subspecies or varieties of one form and that the Indian representative is a tolerably well defined form, described first from a female specimen under the name of *similata* by Rambur, and later from a male, under the name of *stylata*, by the same odontologist.

Male. Expanse 90 mm. Length 50 mm.

Head: eyes dark brown above, olivaceous at the sides and beneath; vesicle occiput and face dark olivaceous brown; forehead dark, glossy, metallic violet; labrum blackish brown: labium olivaceous brown, with the middle lobe and a stripe on the lateral lobe, black. Some greenish yellow occasionally on the sides of face.

Prothorax brown.

Thorax densely pubescent, dark reddish brown with some obscure dark lines laterally and often some pruinescence beneath. Legs black.

Abdomen deep mahogany brown, the last three segments black. Broad, black annules at the junctions of the segments and the borders often edged with black. Anal appendages very long, black.

Wings hyaline, reticulation black; a basal spot in the hindwing of a deep blackish brown, a ray in the intercostal spaces extending as far as the 1st antenodal nervure and separated from the main larger spot, which extends halfway along the subcostal space, nearly or quite up the trigone in the cubital space, for 1 cell in the base of the loop and from thence in a more or less indented line to the tornus, at which spot only it reaches the termen. In some specimens, there is a very marked indentation where the base of the loop cuts into the marking, so that it appears more or less bilobed.

Stigma reddish brown, the hind about two-thirds the size of the fore.

Membrane pale brown, or grey.

Sexual organs: male: lamina similar to *basilaris*; internal tentaculæ longer and narrower than *basilaris* and the end of hook more bent: lobe long and narrow. Female similar to *basilaris* but the vulvar scale smaller and not obscuring the 9th ventral plate which is longer than in that insect.

Female very similar to the male but paler in colour. A broad, black, basal line to the forehead. The abdomen a dark olivaceous brown or yellow, or in many specimens a reddish brown as far as the 10th segment. Basal marking of hindwing more extensive outwardly but less so posteriorly. Outwardly it extends as far as the trigone or slightly within it and for halfway along the body of the loop internal to the mid rib. Posteriorly it fails to reach the tornus and internally, the anal border, where a small, clear hyaline area is enclosed. (A very small, hyaline area, similar to this is occasionally seen in the male but is absent in all my specimens). Wings decidedly smoky.

Burma specimens differ a little from the above description. The face is a deep red, the forehead a lighter red and with a broad, black, basal band. The basal marking extends rather beyond the 1st antenodal nervure, as far as the arc, to just within the trigone, rather more into the loop and to within 2 or 3 cells of the termen. The hyaline area at the base covers about 12 cells. The colour of the marking is a deep reddish brown.

*Hab.*—Similar to that of *basilaris* and with similar habits. Cosmopolitan.

## Genus HYDROBASILEUS.



Fig. 57.—Wings of *Hydrobasileus croceus* to show neuration.

Head relatively large; eyes contiguous for a long distance; forehead prominent and rounded; suture deep; vesicle high and deeply notched.

Prothorax with a small lobe which is hidden beneath the head.

Thorax robust. Legs long and slim; hind femora with a row of numerous small but gradually lengthening spines; mid femora with similar spines but less numerous and rather wider spaced; tibial spines fine, short and numerous; claw-hooks very robust, situated about the middle of claws. Armature of the female very similar but the spines rather less numerous and more widely spaced.

Abdomen relatively short, the base dorso-ventrally dilated, the sides much compressed, tapering from the base to the end. A transverse ridge on the 4th segment.

Wings very long and broad; reticulation moderately close; trigone in the forewing about 3 cells distal to the line of the trigone in the hind; sectors of arc in forewing with a short fusion, in the hind a somewhat longer one, the sectors running very close together at their origin; arc lying between the 1st and 2nd antenodals; antenodal nervures  $12\frac{1}{2}$  to  $18\frac{1}{2}$ , the final incomplete, the distance between the 1st two antenodals distinctly longer than that between those following; base of trigone in the hindwing at the arc; 1 cubital nervure to all wings; no supplementary nervures to the bridge; 8th nervure from the anal angle of trigone; trigone in the forewing very long, with a very short costal side, traversed once or twice; trigone in the hindwing longer than usual, entire, the distal side concave; all hypertrigones entire; subtrigone in the forewing variable, with 3 to 8 cells, its outer angle a little obscure and tending to be lost in the general reticulation; 4th nervure strongly undulated; 2 rows of cells between 5 and 5a; 8th nervure in the forewing moderately curved and short; the discoidal field contracted at the end due to an abrupt curving of the 7th nervure towards the termen, the field usually beginning with one or two rows of 4 cells and then continued as rows of 3 cells; the loop with a long body and short toe, its outer angle very obtuse and its inner border often incomplete and lost in the general reticulation so that the loop is open at the apex; a distinct supplementary sector runs from the angulation of the inner border of loop, which splits up the anal area



into an inner area of narrow, elongated cells arranged in transverse rows and an outer of somewhat larger cells. Stigma equal in the two wings, of moderate size. Membrane moderately large.

Sexual organs: male: lamina depressed, its free border turning outward, tentaculæ straight, the point turning a little outwards; lobe short, oval, a little less prominent than the tentaculæ. Female: border of 8th segment not dilated; end of 8th ventral plate prolonged into a deeply cleft vulvar scale; 9th ventral plate carinated at its distal half and bearing two small horny processes similar to those of *tramea*.

Only one Indian species.

**69. *Hydrobasileus croceus*, Karsch.**

*Tramea croceus*, Brauer.

*Tramea extranea*, Hagen.

*Hydrobasileus extraneus*, Kirby.

Expanse 90 mm. Length 50 mm.

Male: head; eyes reddish brown above, lilaceous or olivaceous at the sides and beneath; vesicle brown; face and forehead ochreous, tinged with red and with a brown, basal line to the latter; labrum yellow.

Prothorax light brown.

Thorax olivaceous or ochreous, paler at the sides where the colour is a whitish green. Legs ochreous or yellow.

Abdomen dark ochreous to reddish brown, the first 4 or 5 segments with the borders finely dark brown and on the 5th to 7th, a brownish, subdorsal stripe. A dorsal band commencing on the 7th which merges into reddish brown on the 8th to 10th segments.

Wings suffused with bright golden yellow, this more intense along the costa of both wings and over the basal area of the hind. The apices often tinted with pale brown, this being more marked in the hindwings. Nervures in the basal part of wing and in the costal fields, bright yellow. The basal marking black and its included nervures a bright yellow; its size and shape somewhat variable, usually beginning at the tornus and running out as far as the apex of the loop where it ascends that structure, being limited outwardly by its outer border. Anteriorly the border of the spot is more or less crenated and runs obliquely from the outer angle of loop to the tornus. Stigma brownish yellow. Antenodal nervures numbering about 17.

Female very similar to the male. The face and forehead olivaceous without any reddish tinge; the thorax similar to the male; the abdomen ochreous, with a reddish tinge and all the sutures, the carina and the lateral borders finely mapped out in black. Wings scarcely differing from those of the male.

Sexual organs. See under genus.

Anal appendages in the female very small, ochreous.

*Hab.*—Throughout India in the moister zones, Ceylon, Burma, Indo-Malay and Indo-China.

(To be continued.)

# SUMMARY OF THE RESULTS FROM THE INDIAN MAMMAL SURVEY

OF THE

## BOMBAY NATURAL HISTORY SOCIETY

By R. C. WROUGHTON, F.Z.S.

### PART VI.

(Continued from page 967 of Volume XXVI.)

#### Subfamily III.—CRICETINÆ.

The CRICETINÆ contains three Indian genera which are arranged in a key, by Blanford, as follows :—

#### Key to the genera of the CRICETINÆ.

- |  |                |
|--|----------------|
| A.—Molars rooted, tubercular ... ..                  | I. CRICETULUS. |
| B.—Molars rootless, elongate, composed<br>of prisms. |                |
| a.—Ear-conch present ... ..                          | II. MICROTUS.  |
| b.—Ear-conch absent ... ..                           | III. ELLOBIUS. |

#### Gen. I.—CRICETULUS.

The separation of CRICETULUS, as a subgenus, from CRICETUS, to represent the oriental forms, was proposed by Milne-Edwards in 1867, and it is now accepted as a full genus.

No. 309. *phæus*, Pall.                      Blanford records a doubt as to  
No. 310. *fulvus*, Blanf.                      the validity of these three species,  
No. 311. *isabellinus*, de Fil.                  Thomas who has quite recently  
studied them (A. M. N. H. (8). xix,  
p. 452, 1917) concludes that none of these names apply to the  
Ladak form, for which he proposes the name *alticola*. There is no  
other species.

#### DISTRIBUTION :—

*C. alticola*, Thomas.

*Type locality* :—Shushal, 13,500',  
Ladak (Ward—Crump).

*Other localities* :—Ladak; Upper  
Sutlej Valley (Whitehead) (B. M.).

*Type* :—B.M. No. 6. 10. 3. 13.

#### Gen. II.—MICROTUS.

This genus has been divided into a large number of subgenera of which, however, only five are found in or on the boundaries of our area. They may be placed in a key as follows :—



Key to the subgenera of MICROTUS.

A.—Pattern of lower anterior molar with some triangles closed

a. Mammæ 2—2=8.

a<sup>1</sup>. Palate normal.

a<sup>2</sup>. Claws small, those on forefeet  
always shortest ... I. MICROTUS.

b<sup>2</sup>. Claws large, those on forefeet  
usually longest ... II. PHAIOMYS.

b<sup>1</sup>. Palate abnormal, ending in a broad  
median plate, cut off from the maxil-  
laries on both sides... III. ALTICOLA.

b. Mammæ 0-2=4 ... IV. HYPERACRIUS.

B.—Pattern of lower anterior molar with all  
triangles open. V. EOTHENOMYS.

Subgenus I.—MICROTUS.

No. 306. *sikimensis*, Hodgs. The only species recorded from our  
area.

DISTRIBUTION :—

*M. (M.) sikimensis*, Hors- Type locality :—Sikkim. (Hodgson).  
field. Other localities:—Sikkim (Hodgson);

Kalapokhri, Darjiling (B. M.), Sikkim  
(M. S. I.)

Type :—B. M. No. 79.11.21.397.

Subgenus II.—PHAIOMYS.

No. 305. *blythi*, Blanf. Bonhote described a species,  
*waltoni*, from Lhasa, of which I  
named a subspecies *petulans*, (J. B. N. H. S., xx, p. 931, 1911),  
on specimens taken by Captain C. H. T. Whitehead. This form  
may be distinguished from *blythi* as follows :—

Key to the forms of PHAIOMYS.

A.—General colour drab ... 1. *blythi*, Blanf.

B.—General colour sepia ... 2. *waltoni petulans*, Wr.

DISTRIBUTION :—

1. *M. (P.) blythi*, Blanford. Type locality :—Tsomoriri, 14,000',  
Western Ladak. (Theobald).

Other localities :—Thibet (B. M.).

Type :—Ind. Mus. Calc. No. a.  
(Type of *leucurus*, Blyth, Ind. Mus.  
Calc. No. a.).

2. *M. (P.) waltoni petulans*, Type locality :—Teza, Upper Sutlej  
Wroughton. Valley. (Captain C. H. T. Whitehead).

Other localities :—Upper Sutlej Val-  
ley (B.M.).

Type :—B. M. No. 10.12.2.27.

## Subgenus III.—ALTICOLA.

No. 300. *roylei*, Gray. Miller dealt with these voles in his paper on Dr. Abbott's collection  
 No. 301. *stoliczkanus*, Blanf. from Central Asia, and I propose  
 No. 302. *stracheyi*, Thos. to follow his results closely. In  
 No. 303. *wynnei*, Blanf. two cases, however, I cannot accept  
 No. 304. *blanfordi*, Scully. the type localities mentioned by him. In the case of *roylei* I have  
 already pointed out in this Journal (J. B. N. H. S., xxiii, p. 299, 1914) my reasons for believing Kumaon and not Kashmir to be the type locality. The name *M. stracheyi*, Thomas, is a re-naming of the animal called "*Cricetus songarus*" by Horsfield, who, in his Catalogue (p. 145) distinctly states that the specimen is "From Capt. R. Strachey's Collection in Ladak." The following is Miller's key to the species:—

*Key to the species of ALTICOLA.**A.*—Under parts dark.

- a.* The third upper molar with 4 salient angles ... 1. *wynnei*, Blanf.

The third upper molar with 6 salient angles.

- a*<sup>1</sup>. Hind-foot 22 mm. ... 2. *roylei*, Gray.

- b*<sup>1</sup>. Hind-foot 20 mm. ... 3. *montosus*, True.

*B.*—Under parts whitish.

- a.* Back bright, ferruginous, brown ... 4. *stoliczkanus*, Bly.

*b.* Back grey or pale fawn.

- a*<sup>1</sup>. Tail vertebræ over 45 mm. ... 5. *blanfordi*, Scull.

- b*<sup>1</sup>. Tail vertebræ under 40 mm.

*a*<sup>2</sup>. Third upper molar with 6 salient angles.

- a*<sup>3</sup>. Anterior upper molar with 10 salient angles ... 6. *stracheyi*, Thos.

- b*<sup>3</sup>. Anterior upper molar with 8 salient angles ... 7. *albicauda*, True.

*b*<sup>2</sup>. Third upper molar with 5 salient angles.

- a*<sup>3</sup>. Teeth heavy; posterior loop of third upper molar forming much less than half of crown ... 8. *acrophilus*, Mill.

- b*<sup>3</sup>. Teeth light; posterior loop of third upper molar forming at least half of crown ... 9. *cricetulus*, Mill.



## DISTRIBUTION :—

1. *M. (A) wynnei*, Blanford. *Type locality* :—Murree, Punjab.  
*Other localities* :—Murree (B. M.).  
*Co-types* :—B. M. Nos. 92.2.27.1 & 8.3.9.18.  
*Lectotype* :—B. M. No. 8.3.9.18.
2. *M. (A.) roylei*, Gray. *Type locality* :—Kumaon. (See above).  
*Other localities* :—Kumaon ; Sikkim (M. S. 1.).  
*Type* :—B. M. No. 2002*a*.
3. *M. (A.) montosus*, Truc. *Type locality* :—Central Kashmir, 11,000'. (Abbott).  
*Other localities* :—Kashmir (Ward) ; Kaghan Valley (Whitehead) (B.M.).  
*Type* :—U. S. Nat. Mus. No. <sup>20145</sup>/<sub>35508</sub>. (Type of *imitator*, Bonhote, B.M. No. 5. 1. 5. 12.).
4. *M. (A.) stoliczkanus*, Blanford. *Type locality* :—Plateaux of Northern Ladak.  
*Other localities* :—None.  
*Co-types* :—Ind. Mus. Calc. Nos. *a* and *b*.
5. *M. (A.) blanfordi*, Scully. *Type locality* :—Gilgit, 9,000'—10,000'.  
*Other localities* :—Gilgit; Skardo (Whitehead) (B. M.).  
*Co-types* :—B. M. Nos. 83.3.1.122 and 8. 3. 9. 17. (Other co-types Ind. Mus. Calc. Nos. *a*. and *b*. in al.).  
*Lectotype* :—B. M. No. 8.3.9.17.
6. *M. (A.) stracheyi*, Thomas. *Type locality* :—Ladak, Strachey, (See above).  
*Other localities* :—Ladak (Ward) (B. M.).  
*Type* :—B. M. No. 60.5.4.113.
7. *M. (A.) albicauda*, True. *Type locality* :—Baldu Valley, Baltistan. (Abbott).  
*Other localities* :—None.  
*Type* :—U. S. Nat. Mus. No. <sup>20393</sup>/<sub>36816</sub>.
8. *M. (A.) acrophilus*, Miller. *Type locality* :—Ladak side of Kara Korum Pass, 17,000'. (Abbott)  
*Other localities* :—None in B. M.  
*Type* :—U. S. Nat. Mus. No. 26.126

9. *M. (A.) cricetulus*, Miller. *Type locality*:—Tso Kyan, 16,000', Ladak. (Abbott).  
*Other localities*:—None.  
*Type*:—U. S. Nat. Mus. No. 84043.

Subgenus IV.—HYPERACRIUS.

Three species have been described (all from Kashmir), one by True and two by Miller, who arranges them in a key as follows:—

*Key to the species of the subgenus HYPERACRIUS.*

- A.*—Hind-foot (with claws) 19 mm.;  
 upper tooth-row 7 mm. ... 1. *aitchisoni*, Mill.  
*B.*—Hind-foot (with claws) 16-18 mm.  
 upper tooth-row 6 mm.  
*a.* Ear, from meatus, 10-11 mm. ... 2. *fertilis*, True.  
*b.* Ear, from meatus, 7-8 mm.... 3. *brachelix*, Mill.

DISTRIBUTION:—

1. *M. (H.) aitchisoni*, Miller. *Type locality*:—Gulmarg, Kashmir.  
*Other localities*:—None.  
*Type*:—B. M. No. 96.11.2.3.  
 2. *M. (H.) fertilis*, True. *Type locality*:—Pir Panjal, 8,500', Kashmir. (Abbott).  
*Other localities*:—Central Kashmir (B. M.).  
*Type*:—U. S. Nat. Mus. No. <sup>20147</sup>/<sub>35510</sub>.  
 3. *M. (H.) brachelix*, Miller. *Type locality*:—Nagmarg, Kashmir (Abbott).  
*Other localities*:—Kashmir (Ward) (B. M.).  
*Type*:—U. S. Nat. Mus. No. 63445.

Subgenus V.—EOTHENOMYS.

This form has never been taken within our limits, but as it, with several subspecies, is found all over Szechuen and may therefore be found in the Kakhyen Hills, I have included it here.

DISTRIBUTION:—

- M. (E.) melanogaster*, Milne-Edwards. *Type locality*:—Moupin, Szechwan.  
*Other localities*:—Not yet taken within the Northern Burmese border.  
*Type*:—In Paris Museum.



## Gen. III.—ELLOBIUS.

The only species of the genus No. 308. *fuscicapillus*, Bly. found within our area. Blanford records that it was taken at Quetta by Hutton, but Blyth when he named it thought that it came from the Himalayas. The British Museum has no Indian specimens, and only three in alcohol contributed by the Afghan Boundary Commission from Bala Marghab, &c., in Afghanistan. A lady recently gave me a description of a small animal seen by her at Quetta, which she stated to be not uncommon, and which could only have been this animal.

## DISTRIBUTION :—

*E. fuscicapillus*, Blyth.      *Type locality*:—Unknown (? Quetta) (Hutton).  
    *Other localities*:—Bala Marghab, Afghanistan.  
    *Type*:—Not traced.

## Family V.—SPALACIDÆ.

Blanford recognises only one genus of the Bamboo Rats, but Thomas has recently revived NYCTOCLEPTES for the giant forms, restricted RHIZOMYS to the medium-sized ones, and established CANNOMYS for the smaller animals of the *badius* type (A. M. N. H. (8) xvi., p. 57, 1915). These three genera may be arranged in key as follows:—

*Key to the genera of the SPALACIDÆ.*

- A.—Size large, condylo-basal length of skull 57-76 mm.; soles of feet granulated; mammæ 1-3=8 or 2-3=10.  
   *a.* Size larger, condylo-basal length of skull 71-76 mm.; posterior sole-pads conjoined ... .. I. NYCTOCLEPTES.  
   *b.* Size smaller, condylo-basal length of skull 57 mm.; posterior sole-pads separate ... .. II. RHIZOMYS.  
 B.—Size small, condylo-basal length of skull 43-50 mm.; solepads not granulated; mammæ 2—2=8 ... III. CANNOMYS.

## Gen. I.—NYCTOCLEPTES.

No. 314. *sumatrensis*, Raff. The proper name for the Indian form is *cinereus*, McClelland. Besides *sumatrensis*, Thomas has distinguished another form from Sumatra, but *cinereus* alone is found within our limits.

## DISTRIBUTION :—

*N. cinereus*, MacClelland.*Type locality* :—Moulmein.*Other localities* :—Tenasserim (M. S. I.).*Type* :—Not traced. (Co-types of *erythrogeenys*, Anderson, Ind. Mus. Calc. Nos. *a.* and *b.*).

## Gen. II.—RHIZOMYS.

No. 313. *pruinus*, Bl.

Besides the Assam species, Thomas has recently described *senex*, from eastern Burma and Yunnan (A. M. N. H. (8) xvi, p. 313, 1915). These two may be distinguished as follows :—

*Key to the species of RHIZOMYS.**A.*—Size smaller, palatilar length of skull32.2 mm. ... 1. *pruinus*, Blyth.*B.*—Size larger, palatilar length of skull37.2 mm. ... 2. *senex*, Thos.

## DISTRIBUTION :—

1. *R. pruinus*, Blyth.*Type locality* :—Cherrapunji, Assam (F. Skipwith).*Other localities* :—Khasi Hills (B. M.).*Co-types* :—Ind. Mus. Calc. Nos. 1. *m.* and *n.*2. *R. senex*, Thomas.*Type locality* :—Yunnan. (O'rii).*Other localities* :—Mountains east of Bhamo (B. M.).*Type* :—B. M. No. 12. 7. 25. 42.

## Gen. III.—CANNOMYS.

Besides *badius*, Hodgs., of Nepal and *castaneus*, Blyth, of Tenasserim, Thomas has recently described *pater* from Mt. Popa and *c. plumbescens* from the Shan States. These four forms may be arranged in a key as follows :—

*Key to the species of CANNOMYS.**A.*—Size larger, condylo-basal length 49-

53 mm.

*a.* Colour normal ... 1. *badius*, Hodgs.*b.* Colour paler and brighter, pinkishcinnamon ... 2. *pater*, Thomas.*B.*—Size smaller, condylo-basal length of skull 43-46 mm.*a.* Colour normal ... 3. *castaneus*, Blyth*b.* Colour plumbeous ... 4. *c. plumbescens*, Thos.



## DISTRIBUTION :—

1. *C. badius*, Hodgson.      *Type locality* :—Nepal (Hodgson).  
*Other localities* :—Darjiling; Khasi Hills; Manipur (B. M.); Chin Hills, Chindwin (M. S. I.).  
*Type* :—B. M. No. 43. 1. 12. 61.
2. *C. pater*, Thomas.      *Type locality* :—Mt. Popa, Burma.  
(B. N. H. S.—Shortridge).  
*Other localities* :—Mt. Popa (M.S.I.).  
*Type* :—B. M. No. 14. 7. 19. 231.
3. *C. castaneus castaneus*,      *Type locality* :—“Arakan” (?)  
Blyth.      (Phayre).  
*Other localities* :—Thaton, Burma; Tenasserim (B. M.).  
*Co-types* :—Ind. Mus. Calc. Nos. 1. and m.
4. *C. castaneus plumbescens*,      *Type locality* :—Gokteik, N. Shan  
Thomas.      States (B. N. H. S.—Shortridge).  
*Other localities* :—N. Shan States (M. S. I.)  
*Type* :—B. M. No. 14. 7. 8. 78.

## Family VI.—HYSTRICIDÆ.

The family includes two genera which may be distinguished as follows :—

*Key to the genera of the Hystricidæ.*

- A.*—Tail short, clothed with spines, with hollow quills at the end ... I. ACANTHION.  
*B.*—Tail long, clothed with scales, with a tuft of bristles at the end... II. ATHERURUS.

## Gen. I.—ACANTHION.

Some years ago Lyon in a paper on Malay Porcupines (Proc. U. S. Nat. Mus. xxxii, p. 575, 1907) revived the name ACANTHION for them. In a note, quoted in my Sind Report (J. B. N. H. S. xxiv, p. 757, 1916), Thomas pointed out that that name must equally be applied to the Indian species, in place of HYSTRIX, as now used.

The Indian Museum Catalogue  
No. 315. *leucura*, G. & H. gives no locality for the type of  
No. 316. *hodgsoni*, Gray. *bengalensis*, and I have entirely  
No. 317. *bengalensis*, Blyth. failed to find any authentic record  
of any other specimen having been  
taken. I propose to take the general view and regard it as a  
synonym of *hodgsoni*. Thomas has quite recently divided off the  
south Burmese porcupine, under the name of *klossi*, from *brachyurus*.

the Malay form. At the commencement of the Survey I named a species, *cuneiceps*, from Cutch (J. B. N. H. S. xxi, p. 771, 1912), in the note incorporated in my Sind Report, quoted above; however, Thomas accepts it only as a subspecies. These forms may be arranged in a key as follows:—

*Key to the species of ACANTHION.*

- A.*—A full crest of long hairs; a mantle of long, thin spines; the stout, stiff spines of the back ringed black and white.
- a.* Size larger, condylo-basal length of skull 155 mm. ... 1. *l. leucurus*, Sykes.
  - b.* Size smaller, condylo-basal length of skull 145 mm. ... 2. *l. cuneiceps*, Wr.
- B.*—Little or no crest; no mantle; chief spines white with a black median ring.
- a.* The black on the chief spines much more than the white tips ... 3. *hodgsoni*, Gray.
  - b.* The black on the chief spines much less than the white tips ... 4. *klossi*, Thos.

DISTRIBUTION:—

1. *A. leucurus leucurus*, Sykes. *Type locality*:—"Dukhun" (Sykes). *Other localities*:—Bannu, Punjab; Rajputana; Sehore; Central India; Dekhan; Nilgiri Hills; Malabar; Ceylon; Nepal (B. M.); Kathiawar; Palanpur; Khandesh; Berars; Dharwar; Coorg; Mysore; Ceylon; Kumaon (M. S. I.).  
*Type*:—B. M. No. 42.8.6.6. (Type of *indica*, Gray and Hardw. not found; Type of *zeylonensis*, Blyth, Ind. Mus. Calc. No. e.; Type of *malabarica*, Sclater, B. M. No. 65. 1. 30. 10.).
2. *A. leucurus cuneiceps*, Wroughton. *Type locality*:—Nokania, Cutch. (B. N. H. S.—Crump). *Other localities*:—Cutch; Sind (M. S. I.).  
*Type*:—B. M. No. 12. 9. 1. 11.
3. *A. hodgsoni*, Gray. *Type locality*:—Nepal (Hodgson). *Other localities*:—Sikkim (B. M.); Bhutan Duars (M. S. I.).



*Co-types*:—B. M. Nos. 45. 1. 8. 8 & 47. 7. 22. 9. (Lectotype of *alophus*, Hodgson, B. M. No. 53. 8. 16. 11; Type of *bengalensis*, Blyth, Ind. Mus. Calc. No. f.).

4. *A. klossi*, Thomas.

*Lectotype*:—B. M. No. 47. 7. 22. 9. *Type locality*:—Tenasserim. (B. N. H. S.—Shortridge).

*Other localities*:—Sagaing, and Mt. Popa, Burma; Tenasserim (M. S. I.)

*Type*:—B. M. No. 14. 12. 8. 223.

Gen. II.—ATHERURUS.

No. 318. *macrura*, L.

The only species found in our area.

DISTRIBUTION:—

*A. macrourus*, Linnæus.

*Type locality*:—"Asia."

*Other localities*:—Tenasserim (B. M.); Tenasserim (M. S. I.).

*Type*:—Unknown.

Suborder II.—DUPLICIDENTATA.

The two Families in this Suborder may be distinguished as follows:—

*Key to the families of the DUPLICIDENTATA.*

A.—Ears, long; a tail present ... I. LEPORIDÆ.

B.—Ears, short; no tail ... II. OCHOTONIDÆ.

Family I.—LEPORIDÆ.

The Hæpid Hare is now generally classed in a separate genus, CAPROLAGUS, from the ordinary hares which make up the genus LEPUS. The two may be distinguished as follows:—

*Key to the genera of the LEPORIDÆ.*

A.—Ears at least as long as the head; tail

white beneath ... I. LEPUS.

B.—Ears shorter than the head; tail

entirely brown ... II. CAPROLAGUS.

Gen. I.—LEPUS.

The first four names in Blandford's list represent the hares of the plains, while the last three are the mountain hares. Of the former, in addition to those here enumerated, Bonhote named *siamensis*, in 1902 (P. Z. S., p. 40), while in the course of this Survey I have added three names (J. B. N. H. S. xxi, p.

No. 319. *nigricollis*, F. Cuv.  
 No. 320. *ruficaudatus*, Geoff.  
 No. 321. *dayanus*, Blanf.  
 No. 322. *peguensis*, Bl.  
 No. 323. *tibetanus*, Waterh.  
 No. 324. *oiostolus*, Hodgs.  
 No. 325. *hipsibius*, Blanf.

338, 1912; xxii, p. 15, 1913; xxiv, p. 42, 1915). Of the mountain forms I think *craspedotis*, Blanford, may be kept distinct from *tibetanus*, but as to *hypsibius*, Blanford, I can offer no opinion. Including these additional forms the species of the true hares may be arranged in a key as follows:—

*Key to the species of LEPUS.*

I.—Hair comparatively short and coarse.

A.—Tail brown above.

- a. Colour darker; ears blackish brown 1. *ruficaudatus*, Geoff.  
 b. Colour paler; ears bright buff ... 2. *rajput*, Wr.

B.—Tail black above.

a. Nape black.

- a*<sup>1</sup>. Feet ochraceous ... 3. *nigricollis*, F. Cuv.  
*b*<sup>1</sup>. Feet white ... 4. *singhala*, Wr.

b. Nape grey or brown or ochraceous.

- a*<sup>1</sup>. Nape grey ... 5. *simcoxi*, Wr.  
*b*<sup>1</sup>. Nape brown, or ochraceous.

- a*<sup>2</sup>. Face pale, grizzled brown and buff; a grey rump ... 6. *dayanus*, Blanf.

*b*<sup>2</sup>. Face darker, grizzled black and tan.

- a*<sup>3</sup>. Nape brown; general ground colour tan... 7. *mahadeva*, Wr.

*b*<sup>3</sup>. Nape ochraceous, or rufous.

- a*<sup>4</sup>. Nape ochraceous; feet white ... 8. *peguensis*, Bly.

- b*<sup>4</sup>. Nape rufous; feet ochraceous ... 9. *siamensis*, Bonh.

II.—Hair long and silky.

A.—Tail black above.

- a. General colour paler, écreu drab; nape fawn ... 10. *craspedotis*, Blanf.  
 b. General colour darker, dark pinkish drab; nape cinnamon rufous.. 11. *tibetanus*, Waterh.

B.—Tail all white.

- a. Ears longer than hindfoot with tarsus ... 12. *oiostolus*, Hodgs.  
 b. Ear not longer than hindfoot with tarsus ... 13. *hypsibius*, Blanf.

DISTRIBUTION:—

1. *L. ruficaudatus*, Geoffroy. *Type locality*:—"Bengal."  
*Other localities*:—Saran, Bengal;  
 Puri, Orissa; Nepal; Sikkim (B.M.);



- Gwalior; Kumaon; Behar; Bengal; Sikkim; Darjiling; Bhutan Duars (M. S. I.).  
*Type* :—Perhaps in Paris Museum.
2. *L. rajput*, Wroughton. *Type locality* :—Sambhar Lake, Rajputana (Adams).  
*Other localities* :—Sambhar Lake, Ulwar (B. M.)  
*Type* :—B. M. No. 85.8.1.342.
3. *L. nigricollis*, F. Cuvier. *Type locality* :—Madras.  
*Other localities* :—S. Mahratha Country; Dekhan; Nilgiri Hills (B. M.); Satara; Ratnagiri; Dharwar; Kanara; Mysore; Bellary; Coorg (M. S. I.).  
*Type* :—Perhaps in Paris Museum.
4. *L. singhala*, Wroughton. *Type locality* :—Kumbukkam, Ceylon (B. N. H. S.—Mayor).  
*Other localities* :—Ceylon (B. M.); Ceylon (M. S. I.).  
*Type* :—B. M. No. 15.7.1.8.
5. *L. simcoxi*, Wroughton. *Type locality* :—Edalabad, Khandesh. (B. N. H. S.—Crump).  
*Other localities* :—Khandesh; Nimar; Berars; Central Provinces (M. S. I.).  
*Type* :—B. M. No. 11.8.7.1.
6. *L. dayanus*, Blanford. *Type locality* :—Sukkur, Sind (Dr. Day).  
*Other localities* :—Sind (B. M.); Sind; Cutch; Palanpur; Kathiawar; (M. S. I.).  
*Co-types* :—B. M. Nos. 90.4.9.2 and 3.  
*Lectotype* :—B. M. No. 90.4.9.3.
7. *L. mahadeva*, Wroughton. *Type locality* :—Dhaim, Mahadeo Hills, Central Provinces. (B. N. H. S.—Crump).  
*Other localities* :—Mahadeo Hills (M. S. I.).  
*Type* :—B. M. No. 12.7.8.1.
8. *L. peguensis*, Blyth. *Type locality* :—Upper Pegu (Phayre).  
*Other localities* :—Rangoon (B. M.); Chindwin; Mt. Popa (M. S. I.).  
*Type* :—Ind. Mus. Calc. No. a.
9. *L. siamensis*, Bonhote. *Type locality* :—Chiengmai, Siam (Lyle).

*Other localities* ;—Siam ; Bhamo (Harrington) (B. M.).

*Type* :—B. M. No. 1.7.7.13.

10. *L. craspedotis*, Blanford. *Type locality* :—Pishin, Baluchistan (Blanford.)

*Other localities* :—Quetta, Baluchistan ; Afghanistan (B. M.).

*Type* :—Ind. Mus. Calc. No. *a*.

11. *L. tibetanus*, Waterhouse. *Type locality* :—Little Thibet. (Vigne).

*Other localities* :—Yassin, Gilgit ; Ladak ; Kurram Valley (B. M.)

*Type* :—B. M. No. 53.8.29.25.

12. *L. oiostolus*, Hodgson.

*Type locality* :—Nepal. (Hodgson).

*Other localities* :—Sikkim ; Ladak ; Upper Indus Valley (B. M.).

*Type* :—B. M. No. 43.1.12. 44. (Type of *pallipes*, Hodgson, not traced).

13. *L. hypsibius*, Blanford.

*Type locality* :—Changchenmo Valley, Ladak (Stoliczka).

*Other localities* :—No specimen.

*Co-types* :—Ind. Mus. Calc. Nos. *a*. and *b*.

#### Gen. II.—CAPROLAGUS.

No. 326, *hispidus*, Pears. The only species of the genus.

#### DISTRIBUTION :—

*C. hispidus*, Pearson.

*Type locality* :—Assam. (McClelland).

*Other localities* :—E. Bengal ; Nepal (B. M.)

*Type* :—Not traced.

#### Family II.—OCHOTONIDÆ.

There is only the one genus.

#### Gen.—OCHOTONA.

No. 327. *roylei*, Ogil.

No. 328. *curzonice*, Hodgs.

No. 329. *macrotis*, Günth.

No. 330. *rufescens*, Gray.

No. 331. *ladacensis*, Günth.

In dealing with the collection made by the Survey in Kumaon, I classed the specimens of this genus as *roylei*. Later when specimens were obtained from Sikkim, it appeared impossible to separate them from *roylei*, and yet they



were apparently different from the Kumaon individuals, so I suggested that Hodgson's name *nipalensis* should be revived for these latter. Now however on laying out all the available material I am of opinion that mere colouring cannot be trusted as a guide where seasonal changes are so great and so common. I therefore propose to call all this group *roylei*, pending the working out of the genus on adequate material. This material is badly wanted, and should include specimens taken "all round the year," or as near it as possible for each locality. Bonhote added a species, *wardi*, (P. Z. S., p. 124, 1904), allied to *rufescens*, which I include in the following key to the species:—

*Key to the species of* OCHOTONA.

A.—Palatal and incisive foramina not distinct.

a. Combined foramina constricted in centre.

a<sup>1</sup>. Colour brownish, with white collar behind the ears ... .. 1. *rufescens*, Gray.

b<sup>1</sup>. Colour greyish, with red head and shoulders in summer ... .. 2. *wardi*, Bonh.

b. Combined foramen not constricted.

a<sup>1</sup>. Ears small, 23mm., or less.

a<sup>2</sup>. Uniform pale brown; feet white. 3. *curzoniae*, Hodgs.

b<sup>2</sup>. Dark brown ... .. 4. *roylei*, Ogil.

b<sup>1</sup>. Ears large, 27 mm. ... .. 5. *macrotis*, Günth.

B.—Palatal and incisive foramina distinct. 6. *ladacensis*, Günth.

DISTRIBUTION :—

1. *O. rufescens*, Gray.

*Type locality* :—Baber's Tomb, Kabul.

*Other localities* :—Ziarat, Baluchistan; Bolan Pass, Quetta; Kurram Valley, Afghanistan (B. M.).

*Co-types* :—B. M. Nos. 44.9.15.9 & 10.

*Lectotype* :—B. M. No. 44.9.15.9.

2. *O. wardi*, Bonhote.

*Type locality* :—Talien, Kashmir, (Col. Ward).

*Other localities* :—Gulmarg, 8,700'; Gugga Nala, 8,900'; Liddar Valley, 9,500'; Sultanmurg, 11,000'; Kishtwar, 11,000'; Badrawar, 12,000'; Kashmir, Chilas, 12,700'; Gilgit, Hazara, 13,700'; Tashgaum, 9,500'; Ladak (B. M.).

*Type* :—B. M. No. 4. 5. 6. 1.

3. *O. curzoniæ*, Hodgson.      *Type locality* :—Nepal. (Hodgson).  
    *Other localities* :—Sikkim (B. M.).  
    *Co-types* :—B. M. Nos. 58.6.24.98  
    and 99.  
    *Lectotype* :—B. M. No. 58. 6.  
    24.99.
4. *O. roylei*, Ogilby.      *Type locality* :—Choor Mountain,  
    Punjab (Ogilby).  
    *Other localities* :—Garwhal; Kuma-  
    on; Nepal; Sikkim (B. M.).  
    *Type* :—B. M. No. 55. 12. 24.326.  
    (Type of *nipalensis*, Hodgs. B. M.  
    No. 43.1.12.63; Type of *hodgsoni*,  
    Blyth, not traced).
5. *O. macrotis*, Günther.      *Type locality* :—Kuenlun Moun-  
    tains, Thibet (Biddulph).  
    *Other localities* :—Shushal, 13,500',  
    and Indus Valley, 12,000'; Ladak  
    (B. M.).  
    *Co-types* :—B. M. No. 44.3.1.14 &  
    75.3.30.3. (Type of *auritus*, Blanford,  
    Ind. Mus. Calc. No. *a*.; Co-types of  
    *griseus*, Blanford, Ind. Mus. Calc.  
    Nos. *c*. and *d*.).  
    *Lectotype* :—B. M. No. 75. 3. 30. 3.
6. *O. ladacensis*, Günther.      *Type locality* :—Chagra Lake,  
    14,000', Ladak; (Biddulph).  
    *Other localities* :—Upper Sutlej Val-  
    ley (Whitehead) (B. M.).  
    *Co-types* :—B. M. No. 75. 3. 3. 32.  
    and specimens in Calcutta.  
    *Lectotype* :—B. M. No. 75.3.  
    30. 2.

#### Order VII.—UNGULATA.

With the exception of the Muntjacs, or Rib-faced Deer, practically nothing has been done in this Order by the Survey. This was to be expected, for the great majority are large animals, which do not lend themselves to collection on a large scale. The late R. Lydekker, F. R. S., brought out a Catalogue of the specimens in the British Museum (Natural History) in 1913, and it seems almost unnecessary to deal with the subject here, but for the convenience of Members I have decided to extract as shortly as possible, the information contained in that Catalogue, in so far as it concerns the Indian region.

The Order is divided into three Suborders as follows :—



*Key to the suborders of the UNGULATA.*

- A.—Upper lip and nose not produced into a flexible trunk.
- a. The third and fourth toes, which may be the only ones, equal in size, and symmetrical to a vertical line drawn between them ... I. ARTIODACTYLA.
- b. The third toe, which may be the only one, larger than the lateral ones, when present, and symmetrical in itself ... II. PERISSODACTYLA.
- B.—Upper lip and nose produced in a trunk ... III. PROBOSCIDEA.

## Suborder I.—ARTIODACTYLA.

The Suborder is divisible into three Sections as follows :—

*Key to the sections of the ARTIODACTYLA.*

- A.—Upper incisors wanting; ruminating.
- a. Horns or antlers present, at least in males... I. PECORA.
- b. No horns or antlers ... II. TRAGULINA.
- B.—Upper incisors present ... III. SUINA.

## Section I.—PECORA.

This Section includes two Families which may be distinguished as follows :—

*Key to the families of the PECORA.*

- A.—Horns permanent; a corneous sheath on a bony core ... I. BOVIDÆ.
- B.—Horns solid, no cores, deciduous, generally branched ... II. CERVIDÆ.

## Family I.—BOVIDÆ.

The BOVIDÆ have been divided into a number of Subfamilies, but in dealing with the restricted Indian fauna, it has not seemed necessary to use them. I may note however that in the following key, the first three genera represent the BOVINÆ, the next four the CAPRINÆ, the next three the RUPICAPRINÆ, the following two the TRAGELAPHINÆ, and the last three the ANTILOPINÆ. The genera of the BOVIDÆ may be arranged in a key as follows :—

*Key to the genera of the BOVIDÆ.*

- I.—Horns smooth, or closely, irregularly, and transversely wrinkled.

*A.*—Horns in the two sexes not differing much in size.

*a.* Horns inserted far apart, at extremities of vertex.

*a*<sup>1</sup>. Horns circular, or oval, in section.

*a*<sup>2</sup>. Dorsal vertebræ 13 ; no long hair on flanks ... ..

I. BIBOS

*b*<sup>2</sup>. Dorsal vertebræ 14 ; a fringe of long hair on flanks ... ..

II. PÖEPHAGUS.

*b*<sup>1</sup>. Horns triangular, or partly so, in section ... ..

III. BUBALUS.

*b.* Horns inserted close together.

*a*<sup>1</sup>. Horns large in male, small, usually mere spikes, in female.

*a*<sup>2</sup>. Males inodorous; horns curved at sides of head.

*a*<sup>3</sup>. Horns in male with a circular or spiral curve ... ..

IV. OVIS.

*b*<sup>3</sup>. Horns in male curved in an S. ... ..

V. PSEUDOÏS.

*b*<sup>2</sup>. Males odorous; horns ascending spirally, or scimitar-shaped ... ..

VI. CAPRA.

*b*<sup>1</sup>. Horns small, not longer than head not differing except in size, in the two sexes.

*a*<sup>2</sup>. Adult horns directed straight back over the head.

*a*<sup>3</sup>. Horns angulate in front...

VII. HEMITRAGUS.

*b*<sup>3</sup>. Horns circular in section.

*a*<sup>4</sup>. Size larger; face glands present ... ..

VIII. CAPRICORNIS.

*b*<sup>4</sup>. Size smaller; face glands absent ... ..

IX. NEMORHÆEDUS

*b*<sup>2</sup>. Adult horns bent downwards, then outwards, and finally upwards ... ..

X. BUDORCAS.

*B.*—Horns in male only.

*a.* Size large; male with two horns; a long tail ... ..

XI. BOSELAPHUS.

*b.* Size small; male usually with four horns; a short tail ... ..

XII. TETRACEROS.

*II.*—Horns with prominent rings at subequal intervals.



A.—Adult horns much longer than head; females hornless.

a. Horns spiral; muzzle not swollen. XIII. ANTILOPE.

b. Horns straight; muzzle swollen... XIV. PANTHOLOPS.

B.—Adult horns scarcely longer than head; female sometimes with horns ... ..

XV. GAZELLA.

### Gen. I.—BIBOS.

Blanford includes in the genus *Bos* all the five subgenera recognised by Lydekker but Thomas supports me in the view that the three subgenera (*Bos* is limited to Europe, and *BISON* to America) represented in India should be treated as full genera.

The species *frontalis* I retain because a wild specimen is claimed as having been killed in No. 338. *gaurus*, H. Smith. Tenasserim. The name *sondaicus*, No. 339. *frontalis*, Lamb. Müller and Schlegel must give place No. 340. *sondaicus*, M. & S. to *banteng*, Raff. which is older by ten years. Lydekker divides *gaurus* and *banteng* into a number of subspecies. The whole may be arranged in a key as follows :—

### Key to the forms of BIBOS.

A.—Horns turning inwards at the tips.

a. No white on back of thighs; no horny mass between the horns.

a<sup>1</sup>. Intercornual ridge rising in a prominent forwardly inclined arch.

a<sup>2</sup>. Generally no dewlap; no throat fringe; colour olive black ... 1. *g. gaurus*, H. Sm.

b<sup>2</sup>. A distinct dewlap and throat fringe; colour darker ... 2. *g. readi*, Lyd.

b<sup>1</sup>. Intercornual ridge forming a less prominent and less forwardly inclined arch, which may be entirely absent ... .. 3. *g. hubbacki*, Lyd.

b. A large white disc on back of thighs; a horny mass connecting the horns; coat unicolor ... .. 4. *bant. birmanicus*, Lyd.

B.—Horns not, or scarcely, turning inwards at tips ... .. 5. *frontalis*, Lamb.

## DISTRIBUTION :—

1. *B. gaurus gaurus*, H. Smith. *Type locality* :—"India."  
*Other localities* :—Rajputana;  
Central Provinces; Western Ghats;  
Kanara; Mysore; Travancore; Nepal;  
Bhutan Duars; Assam (B. M.);  
Kanara; Coorg (M. S. I.).  
*Type* :—Unknown.
2. *B. gaurus readi*, Lydekker. *Type locality* :—Burma. (Read).  
*Other localities* :—Burma; Tenasserim (B. M.).  
*Type* :—In Mr. Read's collection in 1913.
3. *B. gaurus hubbacki*, Lydekker. *Type locality* :—Pahang, Malay Peninsula (Hubback).  
*Other localities* :—Malay Peninsula (B. M.).  
*Type* :—B. M. No. 7.11.27.1.
4. *B. banteng birmanicus*, Lydekker. *Type locality* :—Burma.  
*Other localities* :—Burma (B. M.).  
*Type* :—B. M. No. 79.11.21.16.
5. *B. frontalis*, Lambert. *Type locality* :—Tipperah.  
*Other localities* :—Tenasserim (feral);  
Assam (semi-domesticated) (B. M.).  
*Type* :—Unknown.

## Gen. II.—POEPHAGUS.

- No. 341. *grunniens*, L. The only species of the genus.

## DISTRIBUTION :—

- P. grunniens*, Linnæus. *Type locality* :—Thibet.  
*Other localities* :—Sikkim; Thibet  
Ladak (B. M.).  
*Type* :—Unknown.

## Gen. III.—BUBALUS.

- No. 342. *bubalus*, L. This is the only Indian species,  
(Blanford wrongly spells it *bubalus*),  
but Lydekker recognises three subspecies which he distinguishes  
as follows :—

*Key to the subspecies of B. bubalis*, L.

## A.—Colour blackish.

a. Horns crescentic, or subcircular ... 1. *b. bubalis*, L.

b. Horns directed mainly outwards ... 2. *b. macroceros*,  
Hodgs.

B.—Colour brown dun ... 3. *b. fulvus*, Blanf.



## DISTRIBUTION :—

1. *B. bubalis bubalis*, Type locality :—Rome, Italy (domesticated).  
Linnæus. Other localities :—Assam.  
Type :—Unknown.
2. *B. bubalis macroceros*, Type locality :—Assam.  
Hodgson. Other localities :—Central Assam (B. M.).  
Type :—Not traced.
3. *B. bubalis fulvus*, Type locality :—Mishmi Hills,  
Blanford. Assam (Hume).  
Other localities :—Mishmi Hills (B. M.).  
Co-types :—B. M. No. 91.8.7.215, & in the Indian Museum, Calcutta.  
Lectotype :—B. M. No. 91.8.7.215.

NOTE :—*I believe the wild buffalo is found over considerable areas in the Central Provinces, etc., but I can find no record of any specimen from that part of India in either the British Museum (including the Hume Collection), or the Indian Museum, Calcutta.*

## Gen. IV.—OVIS.

- No. 343. *hodgsoni*, Bl. Lydekker treats the first two as  
 No. 344. *poli*, Bl. subspecies of *ammon*, L., revives  
 No. 345. *vignei*, Bl. *cycloceros*, and names a new form,  
*punjabiensis*, as subspecies of *vignei*.

These five forms may be arranged in a key as follows :—

*Key to the forms of OVIS.*

- A.—Size small, 32-36 inches high at the shoulder; a long-haired and partially (or wholly) black throat ruff; no nuchal or dorsal crest; tips of horns turning mainly inwards.
- a. Horns curving nearly in one plane and tending to form a circle.
    - a<sup>1</sup>. Size larger, reaching 36 inches at shoulder; much black in ruff, which is small ... 1. *v. vignei*, Bly.
    - b<sup>1</sup>. Size smaller, reaching 32 inches at shoulder; ruff strongly developed ... 2. *v. punjabiensis*, Lyd.
  - b. Horns turning outward at tips, forming an incipient spiral ... 3. *v. cycloceros*, Hutt.

*B.*—Size large, 46-48 inches at shoulder; throat ruff, when present, wholly white, yellowish, or greyish; generally a dark nuchal, and sometimes a dorsal, crest; tips of horns markedly everted.

- a.* Tips of horns but slightly everted;  
the whole forming about one com-  
plete circle... .. 4. *a. hodgsoni*, Bly  
*b.* Horns slender, forming an open and  
outwardly extended spiral... .. 5. *a. poli*, Bly.

DISTRIBUTION :—

1. *O. vignei vignei*, Blyth.      Type locality :—Astor (Vigne).  
Other localities :—Ladak (B. M.).  
Type :—Unknown.
2. *O. vignei punjabiensis*, Lydekker.      Type locality :—Salt Range, Punjab (Hume).  
Other localities :—Salt Range, and Akhor Hills, Punjab (B. M.).  
Type :—B. M. No. 12.10.31.65.
3. *O. vignei cycloceros*, Hut-      Type locality :—Afghanistan.  
ton.      Other localities :—Afghanistan ; Baluchistan ; Waziristan (B. M.)  
Type :—Not traced. (Type of *blanfordi*, Hume B. M. No. 12. 10. 31. 71.)
4. *O. ammon hodgsoni*, Blyth.      Type locality :—Thibet. (Hodgson).  
Other localities :—Ladak ; Sikkim ; Thibet (B. M.)  
Type :—B. M. No. 45.1.8.150.
5. *O. ammon poli*, Blyth.      Type locality :—Syr Daria, Pamirs.  
Other localities :—Altai Plateau ; Karakol ; Togdumbash ; Pamirs (B.M.)  
Type :—B. M. No. 79.11.21.20.

Gen. V.—PSEUDOIS.

No. 346. *nahura*, Gray.

The only species in the genus. Hodgson called it *nahoor* five or six years before Gray published

the name *nahura*.

DISTRIBUTION ;—

- P. nahoor*, Hodgson.      *Type locality* :—Northern Nepal  
(Hodgson).



*Other localities* :—Ladak ; Barinda Pass, Punjab ; Garwhal ; Kumaon ; Nepal ; Sikkim (B. M.) ; Sikkim (M. S. I.).

*Type* :—B. M. No. 43.1.12.122 ; (skull and horns 43.1.26.12.).

#### Gen. VI.—CAPRA.

- |                                   |   |
|-----------------------------------|---|
| No. 347. <i>ægagrus</i> , Gmel.   | Lydekker accepts the name                   |
| No. 348. <i>sibirica</i> , Mey.   | <i>blythi</i> , Hume, for the Persian Wild- |
| No. 349. <i>falconeri</i> , Wagn. | goat, ranking it however as a sub-          |
|                                   | species of <i>hircus</i> , L. The Ibex and  |
|                                   | Markhor are well marked forms,              |

but they have been split into a large number of subspecies, based to a great extent on the size and shape of the horns, characters which vary considerably and are most difficult to describe. Lydekker recognises seven of these subspecies, *viz.*, four of the one and five of the other, but confesses his inability to arrange them in any kind of key. I, too, have therefore omitted these forms from my key, but have entered them separately under the heading DISTRIBUTION. The three main forms may be distinguished as follows :—

#### *Key to the forms of CAPRA.*

- A.—Horns scimitar-shaped ; beard long,  
and restricted to the chin.
- a. Front side of horns compressed to an  
edge ... .. 1. *hircus blythi*, Hume.
- b. Front side of horns wide, flattened... 2. *sibirica* group.
- B.—Horns spirally twisted ... .. 3. *falconeri* group.

#### DISTRIBUTION :—

- |  |   |
|--|---|
| 1. <i>C. hircus blythi</i> , Hume.             | <i>Type locality</i> :—Sind.  |
|  | <i>Other localities</i> :—Khirtan Hills,<br>Uric Hill, Surjun Hills, and Mekran<br>Hills, Sind ; Baluchistan (B. M.). |
|  | <i>Type</i> :—B. M. No. 12. 10. 31. 62.   |
| 2 (a). <i>C. sibirica wardi</i> ,<br>Lydekker. | <i>Type locality</i> :—Nanga Parbat, Bal-<br>tistan (Ward).   |
|  | <i>Other localities</i> :—Baltistan (B. M.).  |
|  | <i>Type</i> :—B. M. No. 0. 6. 25. 1.  |
| 2 (b) <i>C. sibirica skyn</i> ,<br>Wagner.     | <i>Type locality</i> :—North and East<br>Kashmir.   |
|  | <i>Other localities</i> :—Tillel Valley and<br>Sind Valley, Kashmir ; Wardwan ;<br>Khagan Valley, Hazara (B. M.).     |
|  | <i>Type</i> :—Unknown.  |

Note :—*Lydekker uses Blyth's name, viz., "sakeen" but Blyth never published a description of that name, consequently Wagner's name, although confessedly based on the animal intended by Blyth, must stand,*

- 2 (c). *C. sibirica pedri*, Type locality :—Gilgit.  
Lorenz. Other localities :—Chitral (B. M.).  
Type :—In Vienna Museum.
- 2 (d). *C. sibirica filippii*, Type locality :—Lahoul.  
Camerano. Other localities :—Spiti ; Upper Sut-  
lej Valley (B. M.).  
Type :—In Turin Museum.
- 3 (a). *C. falconeri falcon-* Type locality :—Astor.  
*eri*, Wagner. Other localities :—Astor ; Baltistan ;  
Indus Valley (B. M.).  
Type :—Unknown.
- 3 (b). *C. falconeri cashmir-* Type locality :—Pir Panjal, Kash-  
*iensis*, Lydekker. mir.  
Other localities :—Pir Panjal (B.M.).  
Lectotype :—B. M. No. 12.10.31.54.
- 3 (c). *C. falconeri mega-* Type locality :—N. Afghanistan.  
*ceros*, Hutton. Other localities :—Afghanistan Ba-  
luchistan (B. M.).  
Type :—Not traced.
- 3 (d). *C. falconeri jerdoni*, Type locality :—Suleman Range,  
Hume. Punjab.  
Other localities :—Dehra Ismail  
Khan and Sheikh Budin, Punjab  
(B. M.).  
Lectotype :—B. M. No. 12.10.31.52.
- 3 (e). *C. falconeri chialta-* Type locality :—Chialtan Hills,  
*nensis*, Lydekker. Baluchistan. (Appleton).  
Other localities :—None.  
Type :—B. M. No. 13. 3. 15. 1.

#### Gen. VII.—HEMITRAGUS.

- No. 350. *jemlaicus*, H. Sm. The name of the Tahr was first  
No. 351. *hylocrius*, Ogil. written *jemlanicus* and then twice  
corrected to *jemlahicus* by H. Smith.

The two species may be distinguished as follows :—

#### Key to the species of HEMITRAGUS.

- A.—Horns flattened externally ; mammæ  
four ... 1. *jemlahicus*, H. Sm.
- B.—Horns convex externally ; mammæ  
two ... 2. *hylocrius*, Og.



## DISTRIBUTION :—

1. *H. jemlahicus*, H. Smith. *Type locality* :—Jemla Hills, Nepal.  
*Other localities* :—Kulu; Sutlej Valley; Garwhal; Kumaon; Nepal; Sikkim (B. M.).  
*Type* :—B. M. No. 886. 1.
2. *H. hylocrius*, Ogilby. *Type locality* :—Nilgiri Hills, Madras.  
*Other localities* :—Nilgiris; Travancore (B. M.).  
*Type* :—B. M. No. 55. 12. 24. 291.

## Gen. VIII.—CAPRICORNIS.

Pocock in a paper published in 1908 (A. M. N. H. (8) i, p. 183) discussed the question of the proper generic names of the Serows and Gorals, and decided that CAPRICORNIS must be used for the former and NEMORHÆDUS for the latter.

No. 352. *bubalinus*, Hodgs. Pocock in 1913 (J. B. N. H. S.

No. 353. *sumatrensis*, Shaw. xxii, p. 296) reviewed the distinguishable forms of this genus, and recorded his reasons for treating them all as subspecies of *sumatrænsis*. The following is adapted from his key, viz. :—

*Key to the forms of C. sumatrænsis.*

A.—Head, body, and limbs not all red.

a. Head, and body brownish black or black.

a<sup>1</sup>. Legs white or dirty white below the knee.

a<sup>2</sup>. Belly only a little paler than the sides, their colours blending; much less white on the jaw, throat, and breast ... 1. *s. thar*, Hodgs.

b<sup>2</sup>. Belly white, sharply contrasted with the rufous brown of the sides; much white on chest, and along lower jaw... 2. *s. rodoni*, Poc.

b<sup>1</sup>. Legs with a considerable amount of rusty or yellow below the knees and hocks.

a<sup>2</sup>. Legs below knees and hocks all rusty; body brownish black... 3. *s. milne-edwardsi*, Dav.

- b*<sup>2</sup>. Legs below knees and hocks  
rusty fawn; knees and fetlocks  
white; body jet black ... 4. *s. jamrachi*, Poc.  
*b*. Head pale chocolate brown, body  
probably that colour also, and legs  
probably white below the knee ... 5. *s. humei*, Poc.  
*B.*—Head, body, and limbs all red ... 6. *s. rubidus*, Bl.

## DISTRIBUTION :—

1. *C. sumatrænsis thar*,  
Hodgson. *Type locality* :—Nepal. (Hodgson).  
*Other localities* :—Sutlej Valley,  
Kumaon; Nepal; Sikkim (B. M.).  
*Lectotype* :—B. M. No. 43.1.12.89.
2. *C. sumatrænsis rodoni*,  
Pocock. *Type locality* :—Chamba State,  
Punjab. (Rodon).  
*Other localities* :—None.  
*Type* :—B. M. No. 2. 12. 11. 1.
3. *C. sumatrænsis milne-*  
*edwardsi*, David. *Type locality* :—Moupin, Sze Chuen.  
*Other localities* :—Sze Chuen; Pegu;  
Moulmein; Mount Muleyit; Tenasse-  
rim (B. M.); N. Shan States; Pegu  
(M.S.I.).  
*Type* :—Perhaps in Paris Museum.
4. *C. sumatrænsis jamrachi*,  
Pocock. *Type locality* :—Kalimpong, Darjil-  
ing.  
*Other localities* :—Kursiong, Dar-  
jiling (B.M.).  
*Type* :—2. 10. 12. 1.
5. *C. sumatrænsis humei*,  
Pocock. *Type locality* :—Kashmir. (Hume).  
*Other localities* :—Pir Panjal, Kash-  
mir (B. M.).  
*Type* :—B. M. No. 91. 8. 7. 65.
6. *C. sumatrænsis rubidus*,  
Blyth. *Type locality* :—Arakan.  
*Other localities* :—Arakan (B. M.)  
*Type* :—Not traced.

## Gen. IX.—NEMORHÆDUS.

In the paper quoted above, Pocock  
No. 354. *goral*, Hardw. • recognises three species which he  
distinguishes as follows :—

*Key to the species of NEMORHÆDUS.*

- A.*—Tail shorter, about three inches long,  
exclusive of hair; black stripe on foreleg  
passing over the knee, down the middle of  
the cannon bone, to the fetlock.



- a.* General colour grey or fawn-grey, more or less suffused with black; spinal stripe absent, or not passing beyond withers; no stripe down middle of tail, and none on back of thigh ... 1. *goral*, Hardw.
- b.* General colour brown, suffused with black; spinal stripe reaching at least to the croup; a black stripe down tail; blackish on back of thigh ... 2. *hodgsoni*, Poc.
- B.*—Tail longer, about five inches without hair; black stripe on foreleg not passing over knee, but turning down outer side of cannon bone ... 3. *griseus*, M. Edw.

## DISTRIBUTION :—

1. *N. goral*, Hardwicke. *Type locality* :—Western Himalaya.  
*Other localities* :—Kashmir; Dhar-amsala, Punjab; Garwhal; Kumaon (B. M.).  
*Type* :—Not traced. (Type of *Urotragus bedfordi*, Lyd. B. M. No. 97. 4.3.1).
2. *N. hodgsoni*, Pocock. *Type locality* :—Sikkim. (Blanford-Mandelli).  
*Other localities* :—Nepal (B. M.).  
*Type* :—B. M. No. 91. 10. 7. 169.
3. *N. griseus*, Milne-Edwards. *Type locality* :—Moupin, Sze Chuen.  
*Other localities* :—Arakan, Upper Burma (B. M.).  
*Type* :—In Paris Museum.

## Gen. X.—BUDORCAS.

Blanford does not include this animal in his Fauna, though he mentions it (Mamm. p. 515, 1891) as occurring in the Mishmi Hills. More recently it has been obtained in Bhutan. The Sze Chuen form may still be found within our limits. The three forms which interest us may be distinguished as follows :—

*Key to the forms of BUDORCAS.*

- A.*—Dorsal stripe extending from occiput to tail; ears, and entire face in front of them, black.

- a.* Rather larger; paler, with large  
dun saddle ... 1. *t. taxicolor*, Hodgs.  
*b.* Rather smaller; darker, with smaller  
saddle ... 2. *t. whitei*, Lyd.  
*B.*—Dorsal stripe not extending forward  
of the withers; black on head confined  
to back of ears, a ring round each eye,  
face in front of same, and tip of chin... 3. *tibetana*, M. Edw.

## DISTRIBUTION :—

- |  |  |
|--|--|
| 1. <i>B. taxicolor taxicolor</i> ,<br>Hodgson. | <i>Type locality</i> :—Mishmi Hills.<br><i>Other localities</i> :—Mishmi Hills<br>(B. M.).<br><i>Co-types</i> :—B. M. Nos. 53.8.16.9,<br>79.11.21.11 and 662.<br><i>Lectotype</i> :—B.M. No. 79.11.21.662. |
| 2. <i>B. taxicolor whitei</i> ,<br>Lydekker.   | <i>Type locality</i> :—Bhutan (J. Claude<br>White).<br><i>Other localities</i> :—Bhutan (B. M.).<br><i>Type</i> :—B. M. No. 6. 8. 24. 1.   |
| 3. <i>B. tibetana</i> , Milne-<br>Edwards.     | <i>Type locality</i> :—Moupin, Sze Chuen.<br><i>Other localities</i> :—Sze Chuen (B. M.)<br><i>Type</i> :—In Paris Museum.   |

## Gen. XI.—BOSELAPHUS.

No. 355. *tragocamelus*, Pall. The only species of the genus.

## DISTRIBUTION :—

- |                                  |   |
|----------------------------------|---|
| <i>B. tragocamelus</i> , Pallas. | <i>Type locality</i> :—Plains of India.<br><i>Other localities</i> :—Central India;<br>Central Provinces; Oudh (B. M.).<br><i>Type</i> :—Unknown. |
|----------------------------------|---|

## Gen. XII.—TETRACEROS.

No. 356. *quadricornis*, The only species of the genus.  
Blainv.

## DISTRIBUTION :—

- |                                      |  |
|--------------------------------------|--|
| <i>T. quadricornis</i> , Blainville. | <i>Type locality</i> :—Plains of India.<br><i>Other localities</i> :—Kathiawar; Cen-<br>tral India; Central Provinces;<br>Southern Mahratha Country; Eastern |
|--------------------------------------|--|



Ghats, Madras (B. M.); Berars ; Central Provinces ; Dharwar (M. S. I.).

*Type* :—B. M. No. 884.c. (skull 43.a.).

Gen. XIII.—ANTILOPE.

No. 357. *cervicapra*, L.

The only species of the genus.

DISTRIBUTION :—

*A. cervicapra*, Linnæus.

*Type locality* :—Plains of India.

*Other localities* :—Punjab ; Kathiawar ; Rajputana ; Central India ; Dharwar (B. M.) ; Sind ; Kathiawar ; Khandesh ; Coorg (M. S. I.).

*Type* :—Unknown.

Gen. XIV.—PANTHOLOPS.

No. 358. *hodgsoni*, Abel.

The only species of the genus.

DISTRIBUTION :—

*P. hodgsoni*, Abel.

*Type locality* :—Hundes District, Thibet.

*Other localities* :—Thibet ; Ladak ; Sikkim ; Kumaon (B. M.).

*Type* :—Unknown.

Gen. XV.—GAZELLA.

No. 359. *bennetti*, Sykes.  
No. 360. *subgutturosa*,  
Güld.  
No. 361. *picticaudata*,  
Hodgs.

The name *subgutturosa* has been restricted to the Yarkhand, &c., forms and the name *seistanica*, Lyd., provided for the form from Baluchistan, &c. The three forms may be distinguished as follows :—

*Key to the species of GAZELLA.*

- A.—Females horned ; horns of males not turned in at tip ; face stripes distinct ... 1. *bennetti*, Sykes.  
B.—Females hornless ; horns of males turned in at tip.

- a.* Face stripes present ; no caudal disk. 2. *seistanica*, Lyd.  
*b.* Face stripes absent ; white caudal  
 disk ... .. 3. *picticaudata*,  
 Hodgs.

## DISTRIBUTION :—

1. *G. bennetti*, Sykes. *Type locality* :—Dekhan. (Sykes).  
*Other localities* :—Sind ; Punjab ;  
 Rajputana ; Central India ; Nepal ;  
 Bengal (B. M.) ; Sind ; Cutch ; Ka-  
 thiawar ; Central India ; Central Pro-  
 vinces ; Khandesh (M. S. I.).  
*Co-types* :—B. M. Nos. 42.8.6.9 &  
 10. (Type of *christyi*, Blyth. B. M.  
 No. 617.a.).  
*Lectotype* :—B. M. No. 42.8.6.9.
2. *G. seistanica*, Lydekker. *Type locality* :—Seistan.  
*Other localities* :—Seistan.  
*Type* :—B. M. No. 10.1.22.2.
3. *G. picticaudata*, Hodgs. *Type locality* :—Hundes District,  
 Thibet.  
*Other localities* :—Thibet ; Ladak ;  
 Sikkim (B. M.).  
*Type* :—B. M. No. 48.6.11.19.

(To be continued.)



## NOTES ON INDIAN BUTTERFLIES.

(Continued from Vol. XXVI, Page 1023.)

BY

LT.-COL. W. H. EVANS, F.Z.S., F.E.S.

19. Fruhstorfer in "Iris" or "Deutsche Entomologische Zeitschrift" No. 27, p. 172, 1914, gives new names to certain Rapalas, viz., *varuna gabenia* for the Assam race, said to be paler than others: *nissa tacola* for the Assam race of the W. Himalayan *nissa*, Kollar.

20. There is a paper called "Übersicht der Lycæniden" by Fruhstorfer in the "Berlin Entomologische Zeitschrift" No. 56, p. 198, 1911-12, which has not been brought to the notice of Indian Lepidopterists; it appeared at the same time as the "Lepidoptera Indica," vols. 7 & 8.

(1). Four varieties of *Poritia hewitsoni*, M, are given: *principalis*, the ordinary form: *interjecta* with the orange spot very large; *nigrita*, a very dark form; *palilia*, an extreme dry season form, very bright blue above and bluish gray below.

(2). *Poritia erycinoides*, Fd, is confined to Sumatra, where it has 3 named varieties; the race flying from Tenasserim to Siam is *phraatica*, Hew,

(3). The Burmese race of the Bornean *Poritia phalia*, Hew, is described as *binghami* from the figure in Bingham's "Butter-flies of India, etc," a somewhat dangerous course; *potina*, Hew, is the Malayan race.

(4). The genus *Zarona* is sunk to *Deramas*, Dist. and *jasoda*, DeN, placed as a race of *livens*, Dist. from Perak.

(5). The genus *Arrhenotrix* is sunk to *Dacalana*, while the following are sunk to *Tajuria*, *Charana*, *Ops*, *Britomartis*, *Bullis*, *Remelana* and *Cophanta*. This, in my opinion, is a good thing, as the differences are not very pronounced.

(6). The N. Indian race of the S. Indian *Camena deva*, M, is called *gada*, Fruh.

(7). *Camena lucida*, Druce, from Borneo is put as the name type of what we used to call *cippus*, Fab, and now call *argentea*; *argentea*, Aur, is the S. Indian race and *minturna*, Fruh, the N. Indian.

(8). The Indian races of the Javan *Tajuria jalindra*, Hors, are given as: *indra*, M, N. India: *macanita*, Fruh, S. India: *tarquina*, Hew, Andamans.

(9). The Ceylon race of *Tajuria cippus*, Fab, from Continental India, is given as *longinus*, Fab; thus we get back a familiar name.

(10). The dry season form of *Tajuria maculata*, Hew, is called *albipicta*, Fruh.

(11). *Tajuria megistia*, Hew, is stated to be Sumatran and the Indian races are: *yajna*, Doh, from Kumaon: *istroidea*, DeN. from Sikkim, based on a dry season form: *thria*, Den, from Tenasserim. The inference is that Fruhstorfer considers that, what we call *istroidea* and *megistia* at present, are seasonal forms of the same species; this does not seem correct.

(12). The Indian race of the Javan *Aphnæus syama*, Hors, is given as *orissana*, M. *Aphnæus zoilus*, M, is treated as a distinct species, of which *zebrinus*, M, is probably a race.

(13). *Aphnæus lohita*, Hors, was described from Java and the Indian races are said to be: *himalayanus*, M, N. E. India; *concanus*, M, South India; *lazularia*, M, Ceylon: *seliga*, Fruh, Tenasserim.

(14). *Aphnæus vulcanus*, Fab, is given from Sikkim, S. India and Ceylon with race *bracteatus*, But, from the N. W. Himalayas to Mhow.

(15). *Aphnæus ictis*, Hew, is given from Ceylon, with the following races: *maximus*, El, from Burma; *lunulifera*, M, from Sikkim; *khurdanus*, M, from Bengal and S. India; *trifurcata*, M, from the N. W. Himalayas, of which *uniformis*, M, and *elima*, M, are names for the dry season form.

(16). *Aphnæus fusca*, M, is treated as a species.

(17). *Loxura atymnus*, Cr, is from S. India with races: *arcuata*, M, from Ceylon; *prabha*, M, from S. India with Andamans: *continentalis*, Fruh, from Sikkim to Burma, the dry season form being *mahara*, Fruh.

(18). The Indian race of the Javan *Sithon nedymond*, Cr, is called *ismarus*, Fruh.

(19). The Indian races of the Javan *Sinthusa nasaka*, Hors, are *pallidior*, Fruh, W. Himalayas and *obscurata*, Fruh, E. Himalayas and presumably Burma.

(20). *Sinthusa chandrana*, M, is the form from W. China and the W. Himalayas with race *grotei*, M, from Sikkim to Burma.

(21). *Sinthusa amba*, Kir, is given from Perak and Borneo and is said to be probably a race of *nasaka*, Hew.

(22). *Horaga onyx*, M, is given from continental India with races *cingalensis*, M, Ceylon: *moulmeina*, M, Burma and *rana*, DeN, Andamans.

(23). *Catapæcilma elegans*, Druce, is from Borneo and the Indian races are *major*, Druce, N. India and Burma: *myosotina*, Fruh, S. India and Ceylon.

(24). The name type of *Hypolyccæna erylus*, God, is not from India: *hima-vantus*, Fruh, is the race from India and Burma and *andamana*, M, from the Andamans.

(25). *Hypolyccæna marciana*, Hew, is confined to Sumatra, Borneo, the Burmese race being *miniata*, M, *Thamala* he does not think is worth considering as a separate genus to *Hypolyccæna*.

(26). *Bindahara phocides*, Fab, is given from Sikkim to Burma: race *moorei*, Fruh, from Ceylon and race *areca*, Fd, from the Nicobars. Race *sugriva*, Hors, which is a familiar name to us, is the Javan form.

(27). The dry season form of *Ticherra acte*, M, is called *idina*, Fruh.

(28). *Cherita freja*, Fab, is given from Sikkim to Burma, with race *pseudo-jaffra*, M, from S. India and Ceylon.

(29). *Marmessus lisias*, Fab, is from Cochin China, the Burmese race being *boisduvali*, M, of which the dry season form is *alcira*, Fruh. *Marmessus moorei*, M, is said not to occur in India.

(30). *Biduanda fabricii*, Doh, is placed as a race of the Malayan species *thesmia*, M.

(31). *Biduanda martina*, Hew, is a race of the Javan *hypoleuca*, Hew, The genera *Manto* and *Drupadia* are sunk to *Biduanda*.

(32). *Ilerda epicles*, God, is Javan: the Indian race is *indicus*, Fruh, the dry season form being *indica*, Fruh, and the wet season form *latilimbata*, Fruh, while *rufonotata*, Fruh, is a variety with very wide red markings.

(33). *Rapala manea*, Hew, is a butterfly found in the Celebes, with an Indian race, *grisea*, M, which is found from Kangra to Burma. The male has no brand; it is metallic blue above and below the discal band is very narrow. This is what we have called *varuna*, Hors, the type of which came from Java. I should think that the Indian form is much more likely to be conspecific with the Javan than the Celebesian form, but Fruhstorfer says *varuna* is a species not occurring in India.

(34). *Rapala deliochus*, Hew, is put as a race of the Javan *kessima*, Hors.

(35). *Rapala nissa*, Koll, is confined to the Western Himalayas and Sikkim, *rectivitta*, M, being the Assam race.



(36) *Rapala xenophon*, Fab, is said to be Javan, the Indian race being *suffusa*, M. What we have hitherto called *xenophon*, is said to be *dieneces*, Hew, of which *intermedius*, Std, is the Andaman race.

(37) *Rapala melampus*, Cr., is confined to S. India and Ceylon and *jarbas*, Fab, is the race from N.-E. India and Burma. Fruhstorfer, however, modifies his views in the reference quoted in Note 19 above, where he says *jarbas* is quite distinct and that *melampus* is a very rare insect only found in Mussoorie. The treatment of these two species is rather a good example of the very sketchy methods adopted by Fruhstorfer.

(38) The genera *Virachola* and *Lehera* are sunk to *Deudoryx*, perhaps a wise step.

(39) *Deudoryx epijarbas*, M., is given from S. India and Ceylon, with the following races: *ancus*, Fruh, N.-W. Himalayas to Sikkim; *amatus*, Fruh, Assam to Tonkin. Perhaps he does not know that this species occurs in the Andamans or a name would be at once forthcoming.

(40) *Deudoryx perse*, Hew, is given from the N.-W. Himalayas to Sikkim: race *ghela*, Fruh, S. India and Ceylon; race *maseas*, Fruh, Andamans; *smilis*, Hew, was described from East India and is taken to represent the race from Tenasserim and Malay Peninsula.

(41) *Deudoryx skinneri*, W. M. & DeN., is considered as the name for a variety of the female of *eryx*, L.

21. In note 17 (J. B. N. H. S. XXIII. p. 310) I stated that I had no access to the original descriptions of *Papilio echo*, Ehrman or *Athymy gynea*, Swin. (1) The reference for the latter is wrongly quoted by Swinhoe in Lep. Ind. and I spent some time at the B. M. searching for the description in vain: I now find that Fruhstorfer in the Macrolepidoptera places it as the Perak race of the Bornean *ambra*, Stg. (2) *Papilio echo* is stated to be very similar to *bootes*, Wd, but there are no spots on the tail and all the crimson markings above and below are much reduced; the upper median cell of the hindwing below bears a faint red streak in the place of the white spot; the tails are longer than in *janaka*, M., but not so long as in *bootes*, Wd. The type specimen is in Mr. Ehrman's collection at Pittsburg and was obtained by the late Bernhard Gerard in the Khasi Hills. Jordan in the Macrolepidoptera places *echo* as = *nigricans*, Roth, the W. China race of *bootes*. (3) In my list of Indian Butterflies J. B. N. H. S. XXI, I omitted 2 *Papilios* given by Jordan in the Macrolepidoptera as occurring in Indian limits: they are *evemon albociliatis*, Fruh, from Assam and the Shan States, a species between *doson*, Fd., and *eurypylus*, L. (4) The second is *arycles*, Bdv., from the Shan States, like *agammemnon*, L. but tailless.

22. Col. Swinhoe has described several new forms in the Annals and Magazine of Natural History.

(1) *Elymnias merula*, Swin, from Kandy. As *hecate*, But, N. Borneo, but on the hindwing below there is a prominent whitish blue spot below the middle of the costa (xvi, 171). This is sure to turn out a variety of *fraterna*, M.

(2) *Hypolimnias curiosa*, Swin, from Starn, C. P. This is obviously a sport of *bolina*, L. (xvi, 171).

(3) *Jamides alocina*, Swin., from Haipaw, Yet Sank, Shan States. It is a milky white insect, tinged with lavender blue. A long description is given, but nothing is mentioned as to how it differs from the other species in this difficult genus. (xxi, 171).

(4). *Rapala nissa nissoides*, Swin., from the same locality as the last, whence a long series was obtained. The discal patch on the forewing above is said to be large, bright and square in shape, while the anal ocellus on the hindwing below is minute. (xvi, 171).

(5). *Astictopterus quadripunctatus*, Swin, Khasi Hills. Above as *olivascens*, M, larger: there are two subapical white dots on the forewing above and three below. (xvi, 171).

(6). In xviii, 209, Swinhoe describes the females of *Bullis buto*, DeN from the Khasi Hills and *Tajuria drucei*, Swin, from Haipaw, Shan States.

(17). *Isamia noblei* is the name Swinhoe gives to a butterfly caught by Noble in Rangoon in 1887 and figured as *irawada*, var, by Moore in Lep. Ind. pl. 47. 1e. (xviii, 481). This is merely a variety of *splendens*, But.

(9). *Isamia eclecta*, Swin, from Palone, Burma, caught in June 1887. There is a long description, but no comparison with any other insect. (xix, 331). This will certainly be a variety of some well-known form, probably *splendens*, But.

(8). *Arhopala dascia*, Swin, from Toungoo. This is said to be rather as *ganesa*, M, but darker and is what Watson figured in plate A., fig. 6, J. B. N. H. S. x., but Watson's specimen had the tails broken off. (xix, 499). Watson was too careful an observer to make a mistake about tails; I have already named his specimens as *ganesa watsoni* in J. B. N. H. S. xxi, 993. *A. dascia* I suspect to be the same as my *ellisi* described in J. B. N. H. S. xxiii. 303; my name has priority.

(10). Swinhoe describes the female of his *Rapala francesca* from Cherra Poonji. (xx. 158).

(11). *Cyrestis atosia*, Swin, from Maymyo. (Graham, presumably the late Major G. H. Graham) said to resemble *irmæ*, Forbes, from Sumatra; it belongs to the *mænalis* group, which is represented in India by the *nivea* group. Swinhoe states that Bingham in his "Butterflies of India" figured *nivalis*, Fd. from Java instead of the very distinct *nivea*, Z. S., which has a broad black costal border from the base to the apex of the forewing. In *atosia* the band is similar, but the transverse lines are dark chocolate brown (xx, 408). It seems to be very near to *nivea*, and I think will prove to be a mere variety of *nivalis*.

(12). *Neptis ancus*, Swin, from Toungoo (Graham). Resembles *clinia* from the Andamans, but above the markings are larger, the submarginal band is pure white, while on the forewing below, the cell streak is narrower and the subapical spots are joined together (xx, 408). This is probably a seasonal form of *susruta*, M.

(13). *Tacupa curiosa*, Swin, Naga Hills (Graham: 3 males). *Tacupa* is a new genus in the group *Astictopterinae*. The specimens were named *Watsoniella swinhœi*, El, but are generically distinct. In describing the genus, *Tacupa*, Swinhoe does not mention how it differs from any other genus, nor does he say how *curiosa* differs from any other species. It is said to be a chocolate black insect, very dark and uniform, the veins prominent, below it is paler, the outer and hind margins of the forewing being paler still (xx, 408).

23. Lord Rothschild gives us some interesting notes on the *Morphinæ* or what he calls *Amathusiidæ*.

(1). In Novitates Zoologicæ xxiii, he figures a male *Stictopthalma* from Kindat, Burma, which he considers to be *sparta*, DeN, and states that *sparta* is a distinct species and not a race of *houqua*, as considered by Fruhstorfer. In N. Z. xxv, he names the *Stictopthalma* caught by Col. Tytler at Sebong, Manipur, *tytleri*, Roth and considers that the male he previously figured from Burma belongs to this species and not to *sparta*, which is a distinct species between *houqua*, Wd, and *louisa* W. M. As far as I know De Nicéville's type of *sparta* remains unique, but I believe that time will show that *tytleri*=*sparta*.



(2). The form of *Enispe euthymius*, Db, from Burma, Siam and the Malay Peninsula is separated as race *intermedia*, Roth; it is intermediate between *euthymius* and *durania*, Fruh. (N. W. xxiii)

(3). *Thauria lathyi*, Fruh, described from Tonkin is a species distinct from *aliris*, Wd, described from Borneo. In Burma we have *aliris intermedia*, Crowley, from N. Burma; *aliris pseudaliris*, But, from S. Burmah and Tenasserim; *lathyi amplifascia*, Roth, from South and Central Burma and Tenasserim. In Toungoo the two species occur together; *intermedia* differs from *amplifascia* in that the oblique light bands are wider and the male has very conspicuous cellular androconial tufts. (N. Z. xxiii and A. M. N. H. xvii, 474).

(4). *Stictopthalma camadeva nagaensis*, Roth, from the Naga Hills. Much paler than *camadeva*, Wd, or *camadeovides*, DeN, and at once conspicuous by the golden yellow costa and small chevrons on the forewing; below all the transverse lines are much straighter. (N. Z. xxiii).

(5). In A. M. N. H. xvii, 474, *Stictopthalma godfreyi*, Roth, is described as a new species from Siam, near *cambodia*, Hew, from Cambodia. Mr. O. C. Ollenbach obtained a specimen of *godfreyi* from Taungshaun, Taung. Tavoy, caught on May 17th, 1917. A forewing of the same species was picked up by Mr. Ollenbach in the neighbourhood of Tavoy in February 1918. *Godfreyi* is a very distinct species of the size of *camadeva*, Wd, the ground colour above being very dark brown; there is a double postdiscal row of large white spots, terminating on the costa in a large white patch: along the termen there are a series of chestnut coloured chevrons. Below the ground colour is a dark fulvous; there are two ocelli on the forewing and three on the hindwing.

24. Dr. Chapman in *Novitates Zoologicae* xxii, p. 80, gives an analysis of the genus *Curetis* based on an examination of the male genitalia. The *thetis* section has the harpe soft and hairy and contains the following species; (1). *thetis*, Drury, from N. India to the Malay Peninsula; (2). *phædrus*, Fab, always paler, from Bengal to Ceylon; (3). *saronis*, M, from the Andamans, with race *nicobarica*, Swin, from the Nicobars and race *gloriosa*, M, from Sylhet to Burma; in *saronis* the postdiscal line is always distinct, while the lunules between veins 5 and 6 on the forewing hardly project beyond the others as they do in *thetis*. In the *bulis* group the harpe is smooth and hard; below the bands are not parallel to the margin as they are in the *thetis* group, this group contains the following species: (1) *bulis*, Db and Hew, from the N. W. Himalayas to Malayana, with *felderi*, Dist, as possibly a race from S. Tenasserim and the Malay Peninsula: (2) *sperthis*, Fd, from Malayana and not recorded from India: (3) *acuta*, M, differing from *bulis* in having a constantly smaller ædagus while there is always a dark tooth projecting from the dark costal border into the discal red area: *paracuta*, DeN, is given as the Chinese race, *acuta* occurring in N. India and Burma, while *dentata*, M, *stigmata*, M, and *angulata*, M, are treated as synonyms. This is a very useful analysis, but I do not understand *acuta*, which was described from China and *paracuta* from Japan: *acuta* is the oldest name and might represent the Chinese race, while *dentata* would be the name for the Indian race. Again *thetis*=*phædrus* is the name usually given to the form from South India and Ceylon, while *gloriosa*, M, is the N. Indian and Burmese species: I do not know where the types of *thetis* or *phædrus* came from:—

25. A good deal has been written about the genus *Parnassius* lately: the more important papers are:—

(a) *Novitates Zoologicae*, xxv, p. 218. Catalogue of the *Parnassiinae*.

(b). *Trans. Ent. Soc.*, 1915, p. 351—360. Some new forms of *Parnassius* by A. Avinoff.

(c) Jahrbuch des Nassavischen vereins fur Naturkunde lxx, p. 4, some notes by Bryk.

I propose to give an up-to-date list of the Indian and S. Thibet forms, culled from these sources, referring to them by their letters when necessary.

(1). *Hypermnestra helios balucha*, M : Verity says *balucha* = *maxima* Gr.Gr., but the B. M. type is a good deal smaller. (a).

(2). *Parnassius jacquemontii*. Bdl. ("Himalaya"). Nashing La & Chita Ladak.

r. *himalayensis*, El. (Lahoul). Kulu : Nila valley : Tonglon, Sikkim : Afghanistan? ab. *impunctata*. Aust. (Sikkim).

r. *chitralensis* M. (Madaglasht, Chitral).

Avinoff in "Records of the Indian Museum" ix, 330, gives *P. rhodius chitralensis*, Verity, from the Shandur Pass, Chitral and Darkot. I think he means *P. jacquemonti chitralensis*, M.

(3). *Parnassius epaphus*, Ober. (Kashmir). Skoro La.

r. *phariensis*, Avinoff. Phari jong, S. Thibet.

r. *sikkimensis*, El. (Kamba Jong, Chumbi Valley)

r. unnamed, a good deal larger than last. Native Sikkim. (a).

r. unnamed, darker, with very large spots. Phari Jong, Tongla Pass : and Yatsung, Sikkim? (a).

r. unnamed, a very white form. Chitral. (a).

(4). *Parnassius discobolus insignis*, Stg. Avinoff in "Records of the Indian Museum" ix., 330, records this from the Shandur Pass, Chitral; I have specimens in my collection referable to this form.

(5). *Parnassius hardwickii*, Gray, (Ladak). Chitral to Sikkim. No races, aberrations or seasonal forms are given. (a).

(6). *Parnassius delphiuss stenosemus*, Honrath. (Kutie Pass. Ladak).

r. *stoliczanus*. Fd. (Narka, Rupshu, Ladak).

ab. *atkinsoni*, M. (Pir Parjal, N. Kashmir.)

r. *lampidius*, Fruh. (Kamba Jong, Chumbi Valley).

r. *macdonaldi*, Roth. (Yatung, Thibet), between *lampidius* and *albulus* ab *styx*, Std. (a).

r. unnamed, 1 ♀ from Kulu, larger than *stoliczanus*. (a).

r. *nicivillei*, Avinoff. (b). Burzil pass, Kashmir : Zogila : Kishtwar Mts. caught by Lt. Brownlow. Between *stoliczanus* and *atkinsoni*, Avinoff has 70 specimens of this form, including two conspicuous aberrations one of which is near *cardinal*, the 3 red ocelli being very well developed; he names it *cardinalia*, Avinoff. The specimens from the Zogi La and the Kishtwar Mts. have the markings on the hindwing more developed and may be a separate race.

r. *mamaievi*, Avinoff. (b) W. Ladak. A member of the *staudingeri-hunza* group.

r. *workmanni*, Avinoff. (b). Saltoro Glacier, Baltistan, caught by Mrs. F. B. Workman's expedition. Markings much reduced : between *mamaievi* and *hunza*.

r. *hunza*. Gr. Gr., (Beik Pass, Hindu Kush).

r. *chitralica*, Verity, (Shandur Pass, Chitral).

r. *kafir*. Avinoff. (b). Mountains between Kila Drosh and Kafiristan, obtained by Mr. A. Smith. No transverse discal band on the forewing : the shape of the hindwing narrower and angled at vein 6.

It looks as if every mountain will be found to have its own race of *delphiuss*, rather reminding one of the land snails in the valleys of a certain Sandwich Island.



- (7). *Parnassius acco*, Gray (Ladak).  
*r. gemmifer*, Fruh. (S. Thibet). Kamba jong (a).  
*r. baileyi*, South. (S. Yatung).  
*r. hunnyngtoni*, Avinoff. (b). Mountains between Sikkim and Thibet caught by Mr. Hannyngton's collectors early in the year. A very small form. The dark basal area differs in contour from *acco*. where it is irregular about the cell. In the male above the dark markings are very red. Cilia are very long and of the ground colour. In the female the pouch is shorter than in *acco*. Avinoff puts this race as a species distinct from *acco*.  
*r. hampsoni*, Avinoff. (b). Karakoram.
- (8) *Parnassius maharaja*, Avinoff. (b), Rupshu, 18,000 feet. Chinese Turkestan and Karakoram. Near *cephalus* and *szechenyi*. I imagine Rupshu must be the Southern province of Ladak, but that is a long way from Chinese Turkestan.
- (9) *Parnassius acdestis*, Gr. Gr.  
*r. rupshuana*, Avinoff. (b). Rupshu, Chinese Turkestan.  
*r. ladakensis*, Avinoff. (b). one female from Shera La, E. Ladak.  
*r. latoni*, Bryk. Kangma, near Shigatse, S. Thibet. A heavily marked and large form of *Acdestis lampidius*, Fruh, from Sikkim. (b).  
*Acdestis* is treated in Seitz "Macrolepidoptera" as a race of *delphius*.
- (10). *Parnassius imperator augustus*, Fruh. (Mountains between Sikkim and Thibet). Yatung (a).
- (11). *Parnassius charltonius*, Gray. (Ladak). Lahoul. (a).  
*r. bryki*, Haude, (Nilang Pass).  
*r. unnamed*. Cashmere. A large form (a).  
*ab. deckerti*. Verity. (Chitral). Ladak. (c).  
*ab. haudei*, Bryk, Kashmere. (c).  
*ab. atroguttata*, Bryk. Nilang Pass, Chitral. (c).  
*r. occidentalis*, Bryk. Chitral. (c). Described from one male and two females.
- (12). *Parnassius simo*, Gray. (Ladak).  
*r. acconus*, Fruh. (Chumbi Valley). Kambajong (a).  
*r. simonides*. Aust. (Internat. Ent. Zeitschrift: 1911-12 v., 360). High mountains N. of Ladak. A small form. Localities given in brackets are those of the type.
26. Mr. Bethune Baker in T. E. S. 1913. p. 205-12, gives some notes on the *Lycenidæ*.; he states that *jaloka*, M., is a distinct species more nearly allied to *pheretiades*, Ev., than to *orbitulus*, Prun, and that *ellisi*, DeN, and *leela*, DeN, are synonymous with *jaloka*. In the Ent. Rec. xxvi, 135 and A. M. N. H. xvii, 378, he discusses the synonymy of the *Lycenidæ*, or, as he calls them the *Ruralidæ*, *Ruralis* has been dug out and found to be older than *Lycæna*. It is used as a generic name to replace *Thecla* plus *Zephyrus*. *Heodes* has also been disinterred and is to replace the familiar *Chrysophanus*. *Polyommatus* has been taken for the *argus* group of *Lycæna* and *baeticus*, Ramb, put in *Lampides* along with *elianus*. The true *Lycænas* are split up into a number of genera, *Lycæna* itself being restricted to the non-Indian *arion* group. Mr. Bethune Baker is working out a revision of the genus, which will be extremely useful, but I wish he would not rob us of our familiar names, nor multiply needlessly the many genera we already have to deal with. His new classification is, I believe, to be based solely on genitalia examinations, regardless of the habits, larval stages, facies, etc.

27. The life-history of *Leptocircus curius*, Fab, is given in the Entomologist xlv, 203. Other papers that may be of interest to Indian naturalists are :—

(a). Notes on Ceylon butterflies, W. Ormiston "Spolia Zeylanica" 6.-2-18. This is a most interesting and useful paper dealing with the habits and localities of Ceylon butterflies. Mr. Ormiston has collected for nearly 30 years and has collected a mass of useful information.

(b) A list of butterflies of Borneo, Part iv., Papilionidæ by J. C. Moulton. Journal No. 67, Dec. 1914, Straits Branch. Royal Asiatic Society, The same author in T. E. S., 1913, 273, writes on new and little known Bornean. *Lycaenidæ*, with a revision of the genus *Thamala*.

(c). Fruhstorfer in "Iris" xxiv., 58. (1910) ran through the *Hesperiidæ* and produced a number of new races. Swinhoe in writing up the *Hesperiidæ* in Lep. Ind. had the paper before him, so it is unnecessary to summarise it, but there are several points in the paper that Swinhoe overlooked.

28. Major H. D. Peile, I. M. S., sent a note on 17-4-15 regarding certain butterflies caught in Nov. 1913 by Col. S. W. Lincoln in thick forest near Anisakan, North Shan States.

(a). *Stictopthalma louisa fruhstorferi*, Rober. 1 female. This race was described from Tonkin and differs from typical *louisa* from S. Burma, in that the tawny brown colour of the hindwing extends and surrounds the sagittate spots.

(b). *Euthalia* sp. Three females, one of which has been deposited in the B. M. and placed with *Euthalia pratti*, Leech, from Central China, to which species it certainly seems more nearly allied than to any other. The B. M. specimen differs from *pratti* in the following respects: ground colour above more bronzy; forewing above, central of the 3 subapical spots missing and the lower spot pushed forward; the black markings in the cell are heavier; of the discal white band the costal streak is faint, the outer edges of the series are more rounded, and the inner edge of the 4th spot from the costa is very oblique; the lower spot is shifted right forward towards the outer margin, on the hindwing above only the costal is white. The hindwing below is more vinous tinted and the apex is browner; there is a trace of a white spot below the lower subapical spot. On the hindwing below only the upper two spots of the discal band are well marked.

Major Peile proposed a new name for these specimens, but I advise him to refrain at present, until the male turns up.



## FURTHER NOTES ON BIRDS ABOUT SIMLA.

BY

HUGH WHISTLER, F.Z.S., M.B.O.U.

In Volume XXVI of the Journal, pages 770-775, I recorded a short series of observations made out at Fagoo near Simla in 1918, under the impression that it would be a long time before I should again have an opportunity of visiting that locality. The unexpected however always happens and the end of October 1919 found me under orders to spend a month's leave in Simla to recover from the effect of illness. This gave me an excellent opportunity of increasing and supplementing the observations of the previous year, more specially as I reached Simla on November 2nd whereas the previous visit had ended on October 31st. From the 2nd to the 13th November I was in Simla itself and thereby limited in my field for observation to occasional expeditions to neighbouring hill sides. The period from 13th to 23rd November was spent at Fagoo with daily collecting and observation, and on the 27th November I finally left Simla for the plains. As many very interesting species were met with, and a series of over a hundred skins was collected, it appears desirable to set these notes on record. With them have been incorporated the results of a short period spent at Fagoo by Captain Claud Ticehurst, R.A.M.C., from the 15th to the 21st October. The original intention was for us both to have been there together, but this plan unfortunately was upset by various causes. It will be seen that the list now given includes 7 species which do not appear in the list of birds of the Simla Hills by Mr. A. E. Jones (Jour. B. N. H. S., Vol. XXVI, 601) and further work in these parts will certainly bring more additions to light. The field is very great and many species are exceedingly local and capricious in their distribution.

In the case of certain of the more interesting specimens obtained I have appended a few notes on measurements, etc., etc. The measurements have been taken in accordance with the methods used in the "Practical Hand-book of British Birds" (Witherby). I feel that some apology is required for the changes in nomenclature, not only as compared with the Fauna, but even with my previous note. I can however only urge that it is inevitable that these notes should reflect the general instability of ornithological nomenclature, annoying at the moment, but intended ultimately to secure a general uniformity.

The Jungle Crow, *Cioides intermedius*, Adams.

Abundant in all the places visited as before.

The Himalayan Nut-cracker, *Nucifraga caryocatactes hemispila*, Vig.

This species was certainly more abundant than on my last visit and was common even at Kufri on November 9th. The gizzards of two specimens preserved contained the long white seeds of some species of pine, and this would appear to be their ordinary food, judging from the frequency with which individuals are to be seen examining the ends of pine branches. They travel considerable distances along the hills to their feeding grounds, and appear to be very regular in their movements.

The Himalayan Great Tit, *Parus major* subsp. ?

A few individuals of this Tit (*Parus atriceps*, Horsf., partim of the Fauna B. I. Vol. 1, p. 46) were observed at 6,500 feet, below Kasumpti on the 6th November, but as the species was not otherwise met I have not yet been able to settle, by comparison of specimens, conclusively which race is the breeding bird of the Simla hills but in all probability it is *Parus major caschmirensis*, Hartert. (Vog. Pal, F. p. 345.)

The Green-backed Tit, *Parus monticolus monticolus*, Vig.

Ticehurst found the Green-backed Tit common out at Fagoo in company with mixed hunting parties, but by the date of my arrival comparatively few were still to be found about Fagoo and Kufri, and these only down in the valleys, rarely venturing higher than 7,500 feet. It was however still common on Jakko. It frequents any type of forest or cultivation.

The Crested Black Tit, *Parus melanolophus*, Vig.

Abundant about Kufri and Fagoo up to 8,500 feet, and invariably met with in flocks, which were accompanied in most cases by a few Goldcrests and individuals of the other species which earlier in the autumn are so common in these hunting parties. On Jakko the Black Tit was not so distinctly in the majority. In October a few birds were still in pairs.

The Yellow-browed Tit, *Parus modestus*, Burton.

A male of this curious Tit was obtained by me on November 24th at an elevation of roughly 7,500 feet, between Mahasoo and Simla.

It was in company with a hunting party composed chiefly of *Ægithalus* and I shot it under the impression that I was procuring some species of *Phylloscopus*. The measurements are as follows:—Bill from skull 18mm.; wing 57·5mm.; tail 35·5mm.; tarsus 16 mm.

The Red-headed Tit, *Ægithalos erythrocephalus erythrocephalus*, Vig.

Occasional flocks were met with in all places, but they did not venture much above 8,000 feet.

The Himalayan Goldcrest, *Regulus regulus himalayensis*, Jerdon.

First observed by Ticehurst near Kufri on October 19th. Several had arrived on Jakko by the second week of November and at Fagoo I found it common; it was only met with in company with hunting parties of *Parus*, *Ægithalos* and *Phylloscopus*.

Of seven specimens obtained in the two trips only two have fire-red feathers in the coronal streaks; all the others have the streak plain lemon yellow, but unfortunately, as I found great difficulty in sexing these minute birds by dissection, I am unable to draw any deductions of value as to whether the presence or absence



of the red feathers is governed by the same conditions as in the typical race ; it would be interesting to examine a better series. There is some variation in the shape of the tail feathers between the sharply cut acuminate feather of the adult male and a coarser more broad and rounded type ; this is doubtless a mark of age. The seven specimens yield the following range of measurements, which I have not given in detail owing to the failure to sex the series satisfactorily :—Bill from skull 10-11 mm. ; wing 50-55mm. ; tail 33·5-37 mm. ; tarsus 15·5-18 mm.

The White-throated Laughing-Thrush, *Garrulax albogularis*, Gould.

A single flock was met with close to Wildflower Hall (8,000 ft.) on November 24th. They had just moved up out of the catchment area.

The Variegated Laughing-Thrush, *Trochalopteron variegatum variegatum*, Vig.

This species has obviously a well marked altitudinal migration as it had almost vanished from the ridge at Fagoo, where I had found it so common last year and where Ticehurst met a few flocks ; and in the first days of my stay at Simla it had arrived on Jakko where it is entirely wanting during the summer. A decrease on the ridge at Kufri was also observable.

The Streaked Laughing-Thrush, *Trochalopteron lineatum griscentior*, Hartert.

No particular change was observable in the status of this species, unless the upper limit of its range at Fagoo had descended by a few hundred feet. It is active early and late but a great skulker in the middle of the day.

The Black-headed Sibia, *Lioptila capistrata pallida*, Hartert.

Only observed about 7,500 ft. on the eastern side of Jakko ; here it was common in small parties which fly from top to top of the trees after the manner of Jays, also descending at times into the low undergrowth below the trees.

The Stripe-throated Siva, *Siva strigula strigula*, Hodgs.

On November 4th and 5th a small flock was frequenting a nullah on the eastern side of Jakko about 7,500 feet, feeding in company with a mixed hunting party. The call is very distinctive being a varied combination of the syllables 'Pip' and 'Peep.' It may be worth noting that I saw a couple snuggle up to rest side by side on a twig, after the manner of Bulbuls or Munias.

The Indian White-eye, *Zosterops palpebrosa*, Temm.

A few were met with in some cultivation at 6,500 feet, below Kasumpti on November 6th, but the species was not otherwise observed by me. Ticehurst however found one with a party of *Phylloscopi* on October 20th.

The Black Bulbul, *Hypsipetes psaroides*, Vigors.

Parties of this Bulbul were observed in Simla on November 4th, and at Kufri on November 9th. On November 19th a large flock was found in the same nullah at Fagoo whence I recorded it in my previous note.

The White-tailed Nuthatch, *Sitta himalayensis*, Jard. and Selby.

A pair were observed about 7,500 feet in a nullah on the eastern side of Jakko on November 11th.

The White-cheeked Nuthatch, *Sitta leucopsis leucopsis*, Gould.

Only observed on November 21st when two or three were met within company with a very large flock of *Parus melanolophus*; this was at 8,500 feet near Fagoo; attention was drawn to their presence by the very curious call "Quair Quair" in a tin trumpet sort of tone, and by their habit of perching on the topmost shoots of the large deodars in which the flock was met. I obtained a single specimen with difficulty, and its companion deserted the hunting party and remained in the locality anxiously calling for the missing bird.

The Ashy-bellied Drongo, *Dicrurus leucophaeus longicaudatus*, Hay.

A single specimen was hawking about in a nullah on the eastern side of Jakko at 7,500 feet on November 6.

The Wall Creeper, *Tichodroma muraria* (L).

One was seen on the railway line near Solon on October 21st and another on Tara Devi on November 2nd.

The Himalayan Tree-Creeper, *Certhia himalayana himalayana*, Vig.

Occasional individuals were met with, usually in the company of hunting parties, throughout my stay at all heights and places visited.

The Cashmere Wren, *Troglodytes troglodytes neglectus*, Brooks.

First observed by me by Sanjouli tunnel on November 13th, and after that date I saw a total of some 20 birds in all about Fagoo and Kufri between 7,500 feet and 8,500 feet. In every case they were solitary, and attention was always drawn to their presence in some bush or tangle of undergrowth by the familiar scolding call.

In the two years a total of 9 specimens were obtained, but as in the case of the Goldcrest I was very unsuccessful in sexing these birds satisfactorily. Measurements of the series are as follows:—

No.	Sex.	Bill from Skull.	Wing.	Tail.	Tarsus.
		mm.	mm.	mm.	mm.
2907	♂	14	50	28	19
2932, 2898.	♀ ♀	12.5 : 13	45.5 : 48	28 : 28.5	17 : —(—)
2906, 2945,	♀ ♀ ♀ (?)	12.5 :	46.5 : 45.5	26.5 : 27.5	(—) : 17.5 :
2953.		13.5 : 13.	47.5.	28.5.	16.5.
2356, 2357.	Sex ? Ossi-	13.5 : 12.5	47.46	28.5 : 25	18 : 16.5
	fication of				
	skulls incomplete.				
2917	Sex ?	13.5	46.5	28.5	19.5

All the above birds are exactly alike in plumage and appearance with the exception of the fact that in Nos. 2898 and 2945 the lower mandible was paler than the upper, whereas in the remainder the entire bill was dark brown, Iris dark brown; legs dark brown; mouth yellow. No moult in any specimen.

Hodgson's Grey-headed Flycatcher-Warbler, *Cryptolopha xanthoschistos xanthoschistos*, Gray.



In marked contrast to the abundance of this species in Simla during the summer months I saw only a single individual at 6,500 ft. below Kasumpti on 6th November. Ticehurst however observed it in October.

The Pale Bush-Warbler, *Horeites pallidus*, Brooks.

Ticehurst observed two individuals in thick scrub near Fagoo, but the species had vanished before my arrival.

The Siberian Chiff Chaff, *Phylloscopus collybita tristis*, Blyth.

In October the Siberian Chiff Chaff was observed commonly on the hill-sides about Fagoo, often singly in bushes, or in company with other *Phylloscopi*. These birds however must have been on passage as I only definitely identified a single specimen, in the ilex trees before the Dak Bungalow at Fagoo on November 22.

Hume's Willow-Warbler, *Phylloscopus humei humei*, Brooks.

Ticehurst found the autumn passage of this Warbler in full swing as it was at the time of his visit the commonest of the *Phylloscopi*, hunting in company with Tits and *P. proregulus*. These birds had practically all vanished before my arrival though I noticed one or two individuals still on Jakko up till November 7th.

Brook's Willow-Warbler, *Phylloscopus subviridis*, Brooks.

Two specimens were obtained from a hunting party at 7,500 ft. on the eastern side of Jakko on November 7th.

Pallas' Willow-Warbler, *Phylloscopus proregulus newtoni*, Gatke.

On my arrival in Simla this Willow-Warbler was fairly common in the hunting parties about 7,500 ft. on Jakko, but I did not with certainty identify it at either Kufri or Fagoo; here however Ticehurst had found it fairly common in October.

The Short-billed Minivet, *Pericrocotus brevirostris*, Vig.

Ticehurst only observed a solitary individual at Fagoo, while I saw a party of 3 females or young males fly past the Dak bungalow at Fagoo on 18th November.

The Common Mynah, *Acridotheres tristis*, (L).

No change was observed in the status of this bird.

The White-browed Blue Flycatcher, *Muscicapa superciliaris*, Jerd.

Observed by Ticehurst in Simla, but it had moved down to lower levels before my arrival.

The Slaty-blue Flycatcher, *Muscicapa leucomelanurus*, Hodgs.

One was obtained by Ticehurst at Fagoo from some bushes in a nullah. It was tame and confiding and took much of its food from the ground.

The Orange-gorgetted Flycatcher, *Muscicapa strophciata*.

I obtained a male of this species from a hunting party of Tits and other small birds in thick jungle at 8,000 ft. near Kufri on November 23rd. It was hawking about the inner boughs of the trees exactly after the manner of *Muscicapa parva parva*.

The Yellow-bellied Flycatcher, *Chelidorrhynx hypoxantha*, Blyth.

A specimen was obtained from a mixed hunting party at 7,500 ft. on the eastern side of Jakko on November 7th.

The Indian Bush-Chat, *Pratincola torquata indica*, Blyth.

A pair of these Chats was observed in cultivation at Fagoo by Ticehurst.

The Dark-grey Bush-Chat, *Oreicola ferrea ferrea*, Gray.

This common summer resident in Simla had vanished before my arrival. A few however were met by Ticehurst who considered it rather a skulker, inclined to dive into cover from its perch on some bush top when noticed.

The Little Fork-tail, *Microcichla scouleri*, Vig.

Ticehurst observed a single bird from the Railway near Solon on 21st October.

The Blue-fronted Redstart, *Phoenicurus frontalis*, Vig.

Ticehurst observed 3 or 4 as early as October 19th about the fallows in forest nullahs. I observed it in small numbers from 7,500 to 8,000 ft., at Simla, Kufri and Fagoo, but the species was probably on the move lower, as it was clearly decreasing in numbers towards the end of my stay. The call note is indistinguishable from that of *Phoenicurus rufiventris*.

The Blue-headed Redstart, *Phoenicurus cœruleocephala*, Vig.

Ticehurst was a little early for this species and only observed two males. I found it in slightly larger numbers than the last species about the same localities, but in addition as low as 6,500 ft., below Kasumpti, on November 6th. This Redstart frequents the upper branches of trees more freely than the other species but is not averse to the thickets of damp fallows which grow in the more shaded portions of the hills and are beloved of *P. frontalis*.

The Golden Bush-Robin, *Tarsiger chrysæus*, Hodg.

Ticehurst met with single example of this handsome species above 8,500 ft. near Kufri on October 21. It was in damp fallow thicket and was tame and confiding.

The Red-flanked Bush-Robin, *Tarsiger rufilatus*, Hodge.

Ticehurst met with one or two individuals amongst pine trees on October 19th.

On my trip the species was met with as follows:—

One at 8,500 ft. at Kufri on November 9th: and three near Fagoo about 8,000 ft. on the following dates, November 13th, 14th and 18th, all were in undergrowth under trees, and the last three were all viewed from the Fagoo-Kufri road in the undergrowth above it. The movements and habits appear to be those of the Redstarts except that the tail is not shivered.

The birds of 9th and 13th November were respectively a male and female just completing their body moult into 1st Winter plumage. The bird of 18th November is similar, but unfortunately not sexed. All three birds agree with the description



of the adult female, so the description of the young given in the Fauna, Vol. II. 107, evidently refers to the juvenile plumage.

The Himalayan Ruby-throat, *Calliope pectoralis*, Gould.

Ticehurst met with this Ruby-throat about 8,000 ft. at Fagoo on October 16th and 18th, obtaining the latter specimen. Both birds were great skulkers and were found in the bushes at the bottom of small nullahs running through cultivation.

It appears probable that a bird which I wounded and lost not far from the same place in October last year was of this species, but I did not include it in my first list as there was then no clue to its identity.

The Red-spotted Blue-throat, *Luscinia suecica*, L.

One was obtained by Ticehurst on October 16th in short scrub on a cultivated hill-side at Fagoo.

The Himalayan Whistling-Thrush, *Myiophoneus temminckii temminckii*, Vig.

A few individuals were observed but the species had I think started to descend to lower levels before my arrival.

The Black-throated Ouzel, *Turdus ruficollis atrogularis*, Temm.

This Ouzel had begun to arrive early in the month about Fagoo and Kufri but only occasional individuals were seen before November 21st when there were a number about the hill behind the dak bungalow at Fagoo, clearly fresh arrivals. A flock was seen in the catchment area near Sanjouli on November 24th.

The Himalayan Missel-Thrush, *Turdus viscivorus bonapartei*, Cab.

During the whole of my stay at Fagoo a loose scattered flock of about 20 Missel-Thrushes was frequenting the southern slopes, and the extreme summit of the hill mentioned above. They appeared to be feeding largely on the small red berries of a curious creeping bush which dotted the bare side of the hill. On November 17th a single individual was found about 7,500 feet in the valley to the west of the ridge on which the State rest-house stands.

This race of Missel-Thrush differs from the European bird *T. v. viscivorus* in its larger size (wing 160-173 mm. as against 145-158 mm.) and in its somewhat paler colouration.

The three specimens obtained measure as follows:—

No.		Bill from Skull.	Wing.	Tail.	Tarsus.
		mm.	mm.	mm.	mm.
2916.	17-11-19 ♂ ad.	27	164·5	116	38
2923.	18-11-19 ♀ ad.	27	159	112·5	36
2937.	21-11-19 ♀ 1st win- ter	26·5	159	109	36

The young bird is distinctly paler, almost whitish, on the chin and throat, than the old pair. No bird shows any trace of moult.

Soft parts:—iris dark brown; orbicular plumbeous; bill dark brown, basal portion of lower mandible horny (No. 2923) or yellowish (No. 2916); legs olive brown; claws black (No. 2923) or olive yellow, joints marked with brown, claws blackish (No. 2916).

The Eastern Alpine Accentor, *Prunella collaris rufilatus*, Sw.

A single bird was shot by the side of the upper road (8,000 ft.) close to Wild-flower Hall on November 24th, but I did not otherwise meet with the Alpine Accentor unless a flock of birds seen flying over head in the same locality was rightly identified as of this species. This specimen proved to be a male, and appears to be referable to the above race, which has been shown by Whitehead (*Ibis*. 1909, 224) to occur on the Samana in winter and to breed on the Sufed Koh above 12,000 feet. The examination of a series of birds is however desirable to confirm the identification.

Jerdon's Accentor, *Prunella strophlatus jerdoni*, Brooks.

Ticehurst met with a party of four of these Accentors at Fagoo as early as October 19th. It was common about the Fagoo-Kufri ridge when I first arrived there and had arrived on Jakko before the middle of November.

The Black-throated Accentor, *Prunella atrigularis*, Brandt.

A few individuals, occasionally one or two together, were met amongst the undergrowth between 7,500 and 8,500 feet on the Fagoo-Kufri ridge on various dates after November 13th. Minute seeds were in the crops of the two specimens obtained.

The Altai Accentor, *Prunella himalayanus*, Blyth.

Single individuals were obtained on November 9th and November 14th about 8,500 feet near Kufri, and a third example was shot from a small flock at the same elevation at Fagoo on November 21st. While the single birds were both extremely confiding and allowed a close approach as they sat motionless on the stones on bank faces, I found that this species when in flocks was extremely hard to procure. These flocks were common, occurring on the hill sides about 7,500-8,500 feet, and appearing indifferent both to the presence or absence of wind and sun (in this they strongly contrasted with most birds about these hills). I found great difficulty in discriminating these flocks from those of the Mountain-Finch; both species are shy and restless, difficult to see when feeding amongst the waste bush clad slopes, rising in loose order, and once roused difficult to mark down again; as the flocks when disturbed fly backward and forward round the contours of the hill sides, rising and lowering many hundred feet. The call note is silvery and very finch-like, and with the reddish-brown iris and the streaked back this Accentor seems to afford a curious case of parallelism with the Mountain-Finch, which in Entomology would certainly be called "Mimicry."

The Black and Yellow Grosbeak, *Pycnorhampus icteroides*, (Vig.)

Only observed at Kufri on November 9th and again on November 23rd and 24th about 8,000 feet:—

The Red-mantled Rosefinch, *Carpodacus rhodochlamys grandis*, Blyth.

This race of Rose-Finch was first described by Blyth (*Journal*, A. S. B. xviii. 810) in 1849 with the type locality of "Range beyond Simla, near snowline," but for some time it was confounded by later writers with the true *Carpodacus rhodochlamys* of Brandt 1843 (type locality Altai). The latter is somewhat



smaller in size (wing of male 87-91), with the rosy superciliary plumes meeting over the forehead, with a heavier beak, and a brighter tint of rose colour on the upper parts.

The restricted range of *C. rh. grandis* is given by Hartert. (Vog. P. F. P. 101.) as from Pushut in N. E. Afghanistan and the Karakorum Mountains, Kashmere, and the Himalayas to Kumaon. There appears however to be but little on record regarding this race and of records of interest to Punjab ornithologists I only find the following:—Jerdon (B. I. i.i. 401) says that it has been obtained in the Tyne range of Mountains between Simla and Mussoorie, and in the Pubher valley, near the snow, on the Simla side by Hutton.

Later Hume writes (Lahore to Yarkand. 259.) "This species is only a winter visitant to the British Himalayas. At that season it is not very uncommon, and one or two specimens are to be found in every collection made during the cold weather near Darjeeling, Almora, Massoorie, Simla and Murree."

The British Museum Catalogue shows the following specimens from the Hume collection:—

- 2 specimens from Kotegarh near Simla.
- ♀ Pumlahie 17 November 1869.
- ♂ Baja in Kunaitee 1st January 1871.
- ♂ ♀ Simla November 1880.
- One Simla 1st December 1880.
- ♂ near Chamba.

The late Captain C. H. T. Whitehead obtained a female on December 15th, below Sardi in the Salt Range (Jhelum district) as he duly recorded in the Journal.

Mr. A. E. Jones has kindly sent me an adult male which he obtained with two others at Chhoi near Campelpore on 27th December 1918, remarking that although the species was fairly common adult males were scarce.

I had hardly expected to meet this bird on this trip and was somewhat surprised on November 9th to find a few associating with Meadow Buntings about 8,500 feet on the ridge above Kufri. After that I discovered that there were a small number about the entire ridge above 8,000 feet between Kufri and Fagoo, but none were actually identified after November 20th. They were met with singly or in small parties in any type of ground or cover, and the call note was a curious "Sqwee."

A small series of 2 adult males, 3 immature males and 2 females were collected. Their measurements are as follows:—

No.	Description.	Bill from skull.	Wing.	Tail.	Tarsus.
		mm.	mm.	mm.	mm.
2893.	Adult male (rose plumage) ..	19	94	73	20·5
2940.	a. " " " ..	17·5	93·5	74	22·5
2894.	Male (1st winter plumage) ..	18	91·5	69·5	22·5
2875.	" " " ..	17·5	87	67	23
2874.	" " " ..	18·5	94	71	22
2899.	Female (probably 1st winter)..	18·5	90	70	22
2900.	" " " ..	20	88	67·5	22

No specimen shows any sign of moult, but I should judge from the appearance of the feathers that whereas the two adult males had moulted rectrices and remiges at the recent autumn moult, the other birds had not done so.

The young males and the females are absolutely alike in plumage and agree completely with the description of the adult female, of which however I have been unable to examine specimens.

Iris brown; legs dull brown, claws blackish; Bill dull brown above, horny livid below (adult males); livid horny (young males and females).

The Pink-browed Rose-Finch, *Carpodacus rhodochroa*, Vig.

A very few of these Rose-Finches were met about 7,500-8,000 feet on Jakko and at Kufri, and the two specimens which I actually obtained I fired at under the impression from their behaviour that I was obtaining Jerdon's Accentor. The call note is very sweet and canarylike.

The Himalayan Greenfinch, *Acanthis spinoides*, Vig.

On Ticehurst's arrival at Fagoo there were small parties of this Finch still about in the cultivation. Adults were in worn breeding dress and a bird in juvenile plumage just out of the nest was obtained by him on October 19th.

The species was not however observed by me apart from the fact that I heard its call note just below Kasumpti Bazar on November 6th.

The House-Sparrow, *Passer domesticus indicus*, Jard & Selby.

Common both in Simla and at about Fagoo rest-house. A pair observed appear somewhat darker on the underparts than birds from the plains.

The Cinnamon Sparrow, *Passer rutilans debilis*, Hartert.

Common about Fagoo, both in October and November and a flock met with in cultivation at 6,500 feet, below Kasumpti on November 6th. When in flocks about cultivation this sparrow is wild and difficult to approach, but the birds about the neighbourhood of houses are tame and familiar enough, either taking the place of the last species or being found together with it.

Stoliczka's Mountain-Finch, *Montifringilla nemoricola altaica*, Eversm.

First observed on November 13th at Kufri where a flock were frequenting the rough undergrowth of sallow which borders the terraced cultivation there at 8,500 feet. One or two other flocks were seen towards Fagoo on later dates, but I never was able to get to terms with this finch and only secured a single specimen by firing at a flock which passed high over my head when I was beating a wood for pheasants. The habits of these flocks have been noted under the heading of *Prunella himalayana*.

The Pine-bunting, *Emberiza leucocephala*, S. G. Gmel.

A few were observed about 8,500 feet at Kufri on November 9th and a single bird was found several hundred feet higher than this on the same ridge on November 14th. The call is a sharp "Pit," "Pit."

The White-capped Bunting, *Emberiza stewarti*, Blyth.

While it was difficult to be sure of identifying this bunting amongst the great numbers of the next species, I certainly saw it about 8,500 feet on the Kufri-Fagoo ridge on November 9th and 14th.



The Eastern Meadow-Bunting, *Emberiza cia stracheyi*, Moore.

As before this was the most abundant species on the hill-sides. It is distinctly pugnacious.

The Crag-Martin, *Riparia rupestris*, Scop.

Only a few odd birds were observed about Fagoo in October although at that time the Crag Martin was common along the road near Sanjouli. In November I saw none near Simla itself but found a good many about Fagoo; here it was rather erratic in its appearance: some days none would be seen or only an occasional individual: on others distinct flights would be hawking about a particular locality. It is possible that the explanation of this is that the species was passing through on migration, a suggestion that is rendered all the more probable by the fact that 3 specimens shot on November 22nd were all very fat.

The Martin, *Chelidon urbica*, subsp. ?

One or two House Martins were observed hawking about the Kufri ridge on November 13th, but as no specimens were procured the exact race must remain in doubt.

The Striated Swallow, *Hirundo rufula*, subsp. ?

On 2nd November from the train I observed a large flock of Swallows, apparently of this type, and clearly on migration, on the telegraph wires near Solon Brewery.

The Upland Pipit, *Oreocorys sylvanus*, Hodgs.

On November 6th I heard what I feel sure was the song of this Pipit at 6,500 feet, below Kasumpti, on the slopes where I have met the bird in previous summers.

The Tree-Pipit, *Anthus trivialis trivialis*, L.

Ticehurst met with a few odd Tree-Pipits on different days in cultivation at Fagoo in October.

The Indian Tree-Pipit, *Anthus trivialis maculatus*, Hodgs.

Ticehurst obtained one from damp sallow undergrowth at Kufri on October 21st.

The Brown Rock-Pipit, *Anthus leucophrys jerdoni*, Finsch.

A single bird was seen by Ticehurst on October 15th at Fagoo.

The Water-Pipit, *Anthus spinoletta blakistoni*, Swinh.

From November 15th onward a large flock of Water Pipits was frequenting the ground described under the paragraph regarding the West Himalayan Skylark. They were very restless and rather shy, spending much of their time on the dry terraced hillside above the pond. The only specimens procured were immature but there need be no hesitation in attributing them to this race, which is very common throughout the Punjab plains in winter, and with specimens of which they closely agree.

The White Wagtail, *Motacilla alba*, subsp. ?

A party of 3 Wagtails of this type were seen passing over at Fagoo on October 15th.

The Grey Wagtail, *Motacilla cinerea*, Tunst.

One was seen by me from the train on November 2nd in a stream bed about 4,000 ft.

The West-Himalayan Skylark, *Alauda gulgula guttata*, Brooks.

Here and there on the bare hill tops near Fagoo may be found small semi-artificial ponds which are used for the watering of local herds of cattle. The neighbourhood of these ponds is usually productive to the ornithologist as, for the most part, other water is scarce. One pond that I paid particular attention to was situated at 8,500 feet. The edges were made up with hard earth, dry and baked in the sun; the water was dark and muddy-looking with no vegetation in it. Round about stretched an expanse of coarse short rough grass and low moor-land plants, scarred here and there by crevices cut into the hard ground by the draining away of rain water, and amply studded with stones. On one side rose the still bleaker summit of the hill to another 200 feet or so, terraced all up its sides with that curious formation of natural steps so familiar to those who live near the Kentish and Sussex downs. The locality thus described was quite small in extent.

Here on November 15th I found a number of these Skylarks and met with them again on subsequent dates about the same place, which they were never willing to leave if it could possibly be avoided; a few others were occasionally met on the bare summits of neighbouring ridges.

Having previous acquaintance with the difficulty of identifying races of Larks I was careful to procure a series of six specimens. These on comparison with a series of *A. g. gulgula* from the Punjab plains (Ludhiana, Jhang) prove to be much larger birds, and darker in colour with less rufous on the upper surface. These are exactly the differences pointed out by Hartert (Vog. P. F., Vol. I., p. 247) between *Alauda g. gulgula* and *A. g. guttata*, for which latter race he gives only the locality of Cashmere. The measurements of the two races he gives respectively as:—*A. g. gulgula*, wing 83-97 mm., *A. g. guttata*, wing 95-102 mm., exceptionally up to 107 mm.

The measurements of my specimens are appended below, and I have no hesitation in referring them to *A. g. guttata*:

No.	Bill from skull.			Wing.	Tail.	Tarsus.
			mm.	mm.	mm.	mm.
2919.	17-11-19	♂	14·5	97	59·5	22·5
2908.	15-11-19	♂	14	98	58·5	22·5
2920.	17-11-19	♂	14	100·5	61	23
2938.	21-11-19	♀	13·5	94·5	60	23·5
2910.	15-11-19	♀	13·5	95·5	58	23·5
2909.	15-11-19	♀	14	95	59	23

No bird shows any trace of moult. The soft parts in all were similar, viz.: iris olive brown; bill horny; culmen and tip blackish; mouth yellowish; legs pale reddish brown; joints and claws dusky; soles yellowish.

The Eastern Skylark, *Alauda arvensis cinerascens*, Ehmeke.

In the locality described under the last species I found a flock of Skylarks on November 15th and with some difficulty procured



two specimens; these were very fat, in distinct contrast to all the specimens of the last species, and it is in consequence probable that these birds were migrating. On the next day a solitary individual was seen on a bare ridge some 900 feet lower but not procured. The measurements of these two birds are given below and while I hesitate to be dogmatic on two specimens, I am of opinion that these birds belong to the same race as a small series of Skylarks obtained near the Chenab in Jhang District during the winter months. These from their very white underparts I identify provisionally with that race of Skylark described in the Hand-book of British Birds under the above name.

No.		Bill from skull.	Wing.	Tail.	Tarsus.
2911.	♂	15.5 mm.	114 mm.	73.5 mm.	24 mm.
2912.	♂	15.5 mm.	116	76	25

My identification is however necessarily provisional because of the situation outlined below.

There is considerable difficulty over the question of the identification of Asiatic races of *Alauda arvensis*, due to the absence of a sufficient series of breeding birds to enable the number of real races to be accurately discriminated.

Yet until such breeding races have been satisfactorily worked out it is most unsatisfactory to endeavour to identify winter or passage birds. This difficulty has not yet been circumvented, and the situation is made much more difficult by the confusion in the past between *A. arvensis* and *A. gulgula*.

The latest examination of the Eastern Skylarks which I have seen is that by Hartert (Vog. Pal. F. Vol. I, p. 247). Hartert states that *Alauda arvensis cinerea*. Ehmeke, now corrected to *A. a. cinerascens* Ehmeke (*vide* Hand-book of B. B. p. 166), is the breeding bird of West Siberia, Turkestan and Persia, wintering further South. He goes on to state that the birds which winter in India and China may belong to that form, or to the Eastern Asiatic form of *Alauda arvensis intermedia*. Swinhoe, or to the supposed Himalayan breeding form which he states it is impossible to be certain of until a series of breeding specimens is available for examination.

This unsatisfactory position led me to take up the question of where these Himalayan birds breed, with the view of then considering how it might be possible to obtain a series. But an examination of the literature of the subject has proved most unsatisfactory. In short I begin to wonder whether there is a breeding form in the Himalayas at all. The evidence on the point appears to be as follows:—

The Fauna of B. I. (Vol. II. 325), in which of course the Skylark is treated as one species, identical in Europe and Asia, gives the following account:—

“*Distribution*.—The whole extent of the Himalayas from Hazara and Kashmir to Assam, where the Skylark appears to be a constant resident, moving about to different levels according to season. In the winter many birds appear to visit the plains of the Punjab and N.-W. Provinces and a lark killed by Dr. Anderson near Bhamo in Upper Burma appears referable to this species.”

Under the next paragraph *Habits* it continues “Breeds in the Himalayas in May and June” giving a brief description of nesting habits.

The first point to be noted is that the synonymy on the same page includes *Alauda triborhyncha*, Hodg. and *Alauda guttata*, Brooks. This latter name is incorrectly attributed to this species. Since *Alauda guttata*, Brooks, is really the Kashmere race of the other species of Skylark *gulgula*, and should be called *Alauda gulgula guttata*, Brooks (Vog. P., F. p. 249), it of course breeds in Kashmere. *Alauda triborhyncha*, Hodgson, which apparently breeds commonly in Ladakh and is figured in "Lahore to Yarkand" (p. 268, plate xxviii) is expressly stated by Hume later (S. F. I., 48) to be identical with *A. guttata*, Brooks. It is therefore clear that part of the evidence on which the breeding of the Skylark in the Himalayas (Kashmere and Ladakh) is based in the Fauna refers not to a skylark of the *arvensis* species, but to a race of the *gulgula* species.

In Hume's Nests and Eggs, (2nd ed., Vol. ii., p. 220) it is expressly stated that a large Skylark, which is certainly not *A. triborhyncha*, "breeds, I believe, pretty well all through the Himalayas, at elevations of from 8,000 to 10,000 feet, although I only know of its nests having been found in Kooloo and Cashmere." The further account there given is not very clear, but mentions Soonamerg as a Cashmere locality where Captain Cock obtained the eggs, and it attributes them to the doubtful race *leiopus*. Yet at one time Hume certainly considered *leiopus* as a synonym of *A. triborhyncha* (S. F. ix. 354). I notice also that while the British Museum Catalogue includes a specimen named *leiopus* from the Hume Collection obtained in "The Sutlej Valley" 'in June' the collection appears to include no Kooloo or Kashmere skins of this species.

Fulton has stated (Journal, B. N. H. S. xvi, p. 56) that the Skylark is a resident between 5,000 and 11,000 feet in Chitral, while Perreau (Jour., B. N. H. S. xix., 901) says "Some present in the winter low down, very common in March; some present in April after which they disappeared, probably going higher." Neither writer mentions any lark of the *Alauda gulgula* type, nor does it appear that specimens were submitted to critical examination, so I am not prepared to accept the statement that any race of *arvensis* breeds in Chitral until skins can be produced.

Ward is quoted as stating (Jour., B. N. H. S. xvii. 724) that *A. arvensis* is a resident in Cashmere, but I have been unable to consult the original reference. As he does not appear to include *Alauda guttata* or *A. gulgula* it is possible that the identification of the birds as *arvensis* may be a mistake. The evidence regarding the breeding of any race of *arvensis* in Cashmere is clearly not conclusive.

On the extreme Western edge of our area there is no evidence at all that any race of *A. arvensis* breeds. Whitehead and Magrath (*Ibis*. 1909, 246) found it to be an abundant winter visitor from November till March, about Kohat and Kurram, and expressly state that it is replaced by *A. gulgula* as a summer breeding species.

From Quetta *arvensis* has been reported as a breeding species, but I understand from private correspondence that really it is only a winter visitor while the breeding birds when verified have proved to be *A. gulgula* and not *arvensis* as recorded.

In Nepal, Scully states (S. F. viii., 338) that a race of *arvensis* which he calls *dulcivox*, is tolerably common in the winter, being



quite social in its habits and frequenting the fields in February and March, leaving about the end of the latter month.

In Gilgit (S. F. Vol. ix) Biddulph found some race of *A. arvensis*, here also named *dulcivox*, to be a winter visitant only, first appearing in November and leaving by the end of March; he also clearly states that although there is a breeding Skylark in Gilgit it belongs to the form *Alauda guttata*, Brooks; it arrives at the end of March and leaves about October. As he appears to have secured a fair series of both birds, and critically notes on their peculiarities these records are of considerably more value than most of those referring to the Himalayan Skylarks.

The respective status of these two Skylarks in Gilgit is again emphasised by Scully in the "Ibis" (as reprinted in S. F. x., 135).

So far the published records which I have been able to consult on the question.

I have made a few enquiries by letter from which it appears that no race of *A. arvensis* is known near Simla or Dharmsala, in the Garhwals or Kumaon, or near Darjheeling.

I have gone into this question at some length, in the hope that members of our society who are suitably situated in the Himalayas will endeavour to obtain a small series of whatever Skylark is breeding in their vicinity, care being taken not to confuse the problem by the inclusion in the breeding series of migrants or non-breeding birds. At present I confess to being sceptical whether any race of *arvensis* does breed in the Himalayas at all, but possibly there is evidence which I have overlooked and which I should be most grateful to have brought to my notice. There are of course many winter records of Skylarks in the plains, but it is not worth collating these until the question of the supposed breeding Himalayan race is settled one way or the other.

The Long-billed Horned-Lark, *Eremophila alpestris longirostris*, Moore.

The greatest prize from my hill pond was however reserved for November 18th. I had just secured a Missel-Thrush and was sitting on the high bank above the pond packing it up and giving directions to my orderly when a bird ran out from under the lee of the bank and along the dry hard margin of the pond quite close to us. It ran like a small plover or sandpiper but I had no difficulty in recognising it as some member of the genus of the Horned Larks, which I had never seen in life before. Luckily my .22 bore with dust shot was ready beside me and I at once shot at the bird which rose and flew across the pond falling dead on the other side. It proved to be a male in freshly moulted plumage. The measurements are as follows:—bill from skull 19, wing 122.5, tail 76, tarsus 26.5 mm.

The West-Himalayan Scaly-bellied Green Wood-pecker, *Picus squamatus squamatus*, Vig.

Two odd ones were met by Ticehurst in Pine forest.

The Brown-fronted Pied Wood-pecker, *Dryobates auriceps*, Vig.  
Fairly common in and about Simla at 7,500 feet.

The Himalayan Pied Wood-pecker, *Dryobates himalayensis*, Jard. & Selby.

An occasional odd bird was observed on the Kufri-Fagoo ridge.

The King Vulture, *Otogyps calvus*, Scop.

A single King Vulture was seen over Jakko on November 12th and again on November 24th.

The Himalayan Griffon Vulture, *Gyps fulvus himalayensis*, Hume.

Common about Simla and Fagoo, both in October and November.

The Egyptian Vulture, *Neophron percnopterus percnopterus*, L.

Common at Simla in October but only a few observed there in November. Not seen near Fagoo.

Dodsworth (Ibis, 1913, p. 544) and A. E. Jones (Journal, B. N. H. S. xxvi, 616) both recorded the Egyptian Vulture of Simla as belonging to the Eastern form *Neophron percnopterus ginginianus*; this appeared to me to be most unlikely so I requested Mr. Jones to examine a few specimens and let me know the result. He accordingly shot a couple and sent me the particulars recorded below. While it is unsafe to dogmatise without further material, it is clear that the description of these two specimens supports my belief that the race of *Neophron* found at Simla is the typical one.

No. 1. Male: shot 7-9-1919 at 7,000 feet, testes small, tail and wing feathers very worn.

*Bill*, pale flesh, streak of pale horn colour on either side of upper mandible.

*Cere*, orange shading to lemon on throat and nape.

*Legs & feet*, flesh colour; *Claws*, horn.

No. 2. Female: shot 7-9-1919 at 7,000 feet. Organs appeared to be those of a bird too old to breed, tail and wing feathers very worn.

*Bill*, flesh colour throughout.

*Cere*, rich orange, shading to lemon on throat and nape.

*Legs & feet*, flesh colour; *Claws*, horn.

The measurements of these two birds were as follows:—

	No. 1.	No. 2.
Bill from gape	$2\frac{3}{4}$ ins.=70 mm.	$2\frac{3}{4}$ ins.=70 mm.
Cere to tip of bill	1 in. =25·4 mm.	$1\frac{1}{16}$ ins.=26·5 mm.
Depth of bill at end of cere	·55 ins.=14 mm.	·55 ins.=14 mm.
Mid toe (without claw) from tarsus.	$2\frac{3}{8}$ ins.=60·4 mm.	$2\frac{3}{8}$ ins.=60·4 mm.
Tarsus	3 ins.=76·2 mm.	$3\frac{1}{8}$ ins.=79·3 mm.
Wing	$20\frac{1}{4}$ ins.=514·4 mm.	$19\frac{1}{2}$ ins.=495·3 mm.
Tail from oil gland	$10\frac{3}{8}$ ins.=263·5 mm.	$10\frac{1}{8}$ ins.=257·2 mm.

The Lämmergeyer, *Gypaëtus barbatulus grandis*, Storr.

Observed as commonly as in the previous year.

Hodgson's Hawk-Eagle, *Spizaëtus nepalensis*, Hodgs.

Ticehurst met with this species on one or two occasions near Fagoo.

The Pariah Kite, *Milvus govinda*, Sykes.

Observed as before.



The Shahn Falcon, *Falco peregrinus peregrinator*, Sundev.

A Falcon seen on the summit of Jakko on November 7th was doubtless of this species.

Buzzard sps., *Buteo* sp.

An occasional Buzzard was seen on the ridge between Fagoo and Kufri about 8,500 ft. in November, but I failed to obtain a specimen or satisfy myself as to what species was represented.

The Common Kestrel, *Falco tinnunculus*, subsp. ?

A few odd birds were observed from 6,500 feet at Kasumpti to 8,500 ft. at Fagoo both in October and December, but I was unable to obtain any specimens.

The Indian Turtle-Dove, *Streptopelia turtur ferrago*, Eversm.

Not common. With the exception of a small party which were usually to be found in a small patch of pines about 8,500 feet about Kufri; only one or two odd birds were seen along the Kufri-Fagoo ridge.

The Eastern Wood-Pigeon, *Palumbus palumbus casiotis*, Bp.

One was seen at 8,500 feet near Fagoo on November 15th.

The Chukor Partridge, *Alectoris graeca chukor*, Gray.

On one stretch of very stony and barren hill-side I found many coveys of Chukor, but elsewhere met with only a single pair which kept very closely to the same spot.

I only discovered the favoured locality on the last day of my visit through hearing and seeing some 15 to 20 Chukor acting in a very excited manner for no apparent cause. They were calling loudly, running, and making short flights round about a patch of ground which appeared favourable for a stalk. This I assayed, though only a single 410 bore was in my hands, and had managed to get well into the centre of the birds when I discovered that the excitement was due to a large red fox which leapt out of a hollow in the ground near me. He had doubtless also been engaged on a stalk and I had spoilt his chance; one covey was only a few yards from him and ignorant of his whereabouts.

The Black Partridge, *Francolinus francolinus asiæ*.

On November 18th a pair of Black Partridges were flushed on a fairly open hill-side at Fagoo at an elevation of 8,500 feet.

The White-crested Kalij Pheasant, *Gennæus albocristatus*, Vig.

The Koklas Pheasant, *Pucrasia pucrasia macrolopha*, Less.

I did not pay much attention to Pheasants from the point of view of sport but noticed that both the above species were present in small numbers on much of the ground which I visited.

The crop contents were examined of a hen of each species shot in the evening of the same day on very nearly the same ground. The Koklas had been feeding almost entirely on coarse green grass; with this was a very little maiden hair fern and moss, and a few grass seeds. The Kalij on the other hand had eaten a much more varied selection of seeds, roots, small bulbs and a little clover.

The Woodcock, *Scolopax rusticola*, L.

On the 19th November I shot a Woodcock on the Kufri road at about 8,000 feet. It was feeding in thick undergrowth just above the road and so close to it that a dog with me scented it from the road and ran up and flushed it. This bird was extremely fat and was preserved with difficulty. A second bird was apparently flushed the same evening but I did not actually see it, though a man with me declared that it had risen in front of him from a path. In support of his statement he showed me fresh borings which might have been made by a Woodcock.

This appears a suitable opportunity also to record the fact that the Woodcock has at last been proved to breed close to Simla.

On 15th May 1919 a valued correspondent met a hen Woodcock with 4 chicks only 2 or 3 days old, in the downy plumage; these were in fairly heavy jungle about 8,500 ft. My correspondent caught the 4 chicks and the old bird came quite close to him in her anxiety until 3 of the chicks were given back to her; the fourth was preserved for me and it is now in the collection of Capt. C. B. Ticehurst. On the same day in the same locality a nest was found containing a single chipped and dented egg which was quite fresh but apparently deserted. No bird was seen near it and it was finally taken on the 19th May and given to me; it measures 47.5 × 34.5 mm, and is in my opinion undoubtedly the egg of a Woodcock.

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## THE POWER OF SCENT IN WILD ANIMALS

BY

E. C. STUART BAKER, F.Z.S., F.L.S., M.B.O.U.

Recently there has been a good deal of discussion as to the powers of scent in wild animals, more especially amongst the *Felidae*, and rather contradictory opinions have been given on the subject.

My own opinion is that cats have a very indifferent sense of smell, and it may be of interest if I give some of the reasons which have led me to this belief.

Although many minor incidents occurring during the earlier days of my life in the Indian jungles had made me pretty sure that such was the case, it was not until I tried to work out the life history of a certain notorious man-eating tiger that I became quite confirmed in my own mind of the defectiveness of this sense in tigers.

These animals, as every one knows, obtain many of their victims by lying up in extra thick patches of cover beside tracks made, through forest and grass, by cattle, deer, pigs, etc. As long as the tiger is favoured by the wind, the unfortunate prospective dinner will often wander right up to within a few paces of the would-be diner without getting any hint of his presence and it is not until the tiger makes his actual rush, that he knows, too late, of his danger. But I believe it is equally the case that in many instances the tiger, himself, does not know what kind of animal he is charging upon until he is practically on the top of his victim.

It is this, indeed, which in some cases turns an ordinary tiger into a man-eater, and such was the case in the present instance. It appears that a party of villagers were returning from their work on their fields and were passing along a narrow deer track which led towards their home through a dense patch of jungle, such as generally grows up the second year on abandoned cultivation. Weary with their work there was no conversation and, beyond the soft pad, pad of their feet along the muddy track, nothing to indicate to a watcher what it was that was using the path regularly traversed by Barking-deer and Sambhur on their way to water. Suddenly there was a hoarse coughing grunt and the tiger rushed out, knocked over the leading member of the band and then incontinently bolted down the path as hard as he could go. One of the men describing the episode to me some time after said that men and tiger were racing down the path together, and that though two or three more of the party were knocked over as they ran none were touched by tooth or claw and the tiger seemed quite as frightened as themselves.

It was nearly dusk when the man was killed and the sudden eastern darkness fast setting down, so the villagers left the body where it lay and hurried back to their village as fast as they could. The unfortunate man was a Mikir, a tribe who, however brave they may be by daylight, will never leave the immediate vicinity of their own houses by night for they believe every patch of forest, every hill and every piece of water to be the abode of some wicked spirit who works his evil will in the hours of darkness. It was not, therefore, until the next morning that they returned to recover the body of their comrade and when they did so they found on arriving at the spot it had been partially eaten, the legs from the buttocks to the knees being finished. The evidence given by the tiger's tracks in the muddy pathway showed that he had not touched the body until hard driven by hunger. His footprints showed that he could not have returned to it until early morning after the dew had ceased to fall and, apparently, he had several times come up to within a few feet of the corpse from either side before

finally mustering up sufficient pluck to satisfy his hunger. Even after commencing to feed he had, seemingly, had one or two bad frights as he had rushed headlong from the body more than once prior to his being disturbed by the Mikers in the morning.

In this case there can be no doubt that the tiger had relied entirely on his sense of hearing so that until he actually struck the man down he had no idea that he was attacking anything more formidable than deer or some other of his usual game. When he found what he had done he was at first smitten with terror, but later, failing to kill anything else, he was tempted to go back and investigate and then by degrees hunger overcame his natural fear of man and he commenced the meal which eventually turned him into the boldest and most clever man-eater I have known.

On one occasion when walking through the forest with a shot gun and accompanied by some terriers I came on this same tiger standing some five yards away, listening with ears pricked up and eyes staring towards me, but evidently not using his sense of smell at all. The small dogs routed him for a time but that evening he returned and killed a coolie within a few feet of where I had been standing.

On yet another occasion I saw him as I was coming up a pathway leading from my office to my bungalow. The pathway was cut on the side of a sloping hill, covered with sun grass from three to four feet high, and suddenly down below me I caught sight of the tiger moving along a track made by the school boys taking a short cut to the school house fifty yards away down the hill. It was about three o'clock on a sunny afternoon and the school was in full swing, the boys after the manner of all small Indian school boys, hard at work reciting loudly the lessons they were learning, making a perfect babel of noise. The tiger was slinking along this track, his attention entirely fixed on the sound in front of him and evidently gloating over a hoped for easily won meal, not the first obtained in similar circumstances. I was not thirty yards from him and the wind was blowing steadily from me to him, but he seemed utterly unconscious of my presence until turning my foot in the gravelly soil I made a sound which attracted his attention. One glimpse of my white sola-topee, evidently a most dangerous enemy in his opinion, was enough for him and he quickly and quietly slunk away into some jungle and when, a few seconds later, my chaprassie came running up with my rifle he was no longer to be found.

Once, however, I was even nearer than this to a tiger without his being able to smell me. At the time I was out after Sambhur and was sneaking along a deep nullah running through some open bamboo forest, here and there dotted with small but very dense Ber bushes. It was just as dawn was breaking and in the deep hollow the light was still very dim as I dodged from one clump of bushes to another. As I got to one of these clumps I heard something more on the far side and shake the bush, very much as if a deer was feeding on the Ber berries and shaking the branches as he pulled at them. I was just about to step from behind the bush when I heard a deep "Aough h h" and of course at once realized that my supposed deer was a tiger. There may have been five or six feet between us, certainly not more and though I could smell the tiger strongly he evidently was very doubtful about me and kept inhaling long breaths in the attempt to make out what I was. Finally, deciding it was something suspicious, he began to trot away in the opposite direction and as I stepped from behind the bush raced up the bank giving me a snap-shot which luckily spined him and rolled him over. He had originally come up to the bush from the opposite direction to myself and was apparently lying beside it when the sound of my approach roused him up.



On yet another occasion I lay for some minutes on a sandbank within 25 yards of a tigress as she drank, and she calmly alternately lapped and cleaned herself without any suspicions of my presence before she eventually put herself into a satisfactory position for a shot and I was able to terminate the interview.

Most sportsmen who have sat up for tiger, whether on mychauns comparatively high up or actually on the ground behind screens, know that it really matters little which way the wind blows as far as frightening the tiger goes but that, on the other hand, the most absolute silence is essential.

A clever tiger who lies up any where within hearing distance of his kill over which a mychaun has been erected, will never return to it, however hungry he may be, unless he has *heard* the last—as far as he can tell—of his persecutors clear off. A very good instance of this was given me by Mr. G. M. Peddie of the Assam Bengal Railway. A tiger had been regularly killing cattle and goats belonging to his coolies and every attempt to shoot it had failed. Time after time Mr. Peddie had had mychauns made over the kill and at other times when a tree with a convenient branch was handy had gone out by himself with one gun bearer and climbed on to the perch and waited. Whatever his arrangements were, however, the result was always the same—no tiger,—yet a visit the following morning generally showed that after he had gone the tiger had returned and made a hearty meal.

Happening to pass through Mr. Peddie's camp at this time he told me of his failures and said that he thought the tiger must be able to smell him. I advised him the next time he went out to take a number of men with him, let them make as much noise as they liked whilst he climbed up to his mychaun and, after he had settled himself comfortably, to let them go away still talking as they went.

Within two days I got a letter to say that the tiger had been bagged. Mr. Peddie had followed my suggestions with the result that immediately the coolies who had come with him to the kill had noisily retired for about a couple of hundred yards, the tiger had sneaked out, walked round the far side of the kill listening to the men in the distance, followed them slowly up and, finally, after he thought he had heard them off the premises returned to his dinner and was promptly shot with a single bullet through heart and lungs. Mr. Peddie told me that judging from the action of the tiger he followed the men almost entirely by sound though every few paces he put his nose to the ground and inhaled a deep breath as if getting a whiff of the trail left by the men. At the same time invariably after one of these inhalations he finished by cocking his ears and listening intently as if to verify his poor sense of smell by his outer sense of hearing. \*

The trick of making a very noisy approach to a kill and an even more noisy departure, so that the fact that one or more persons have been left behind may not be detected, is of course a very old one. It had been taught me by my father but has often proved effective within my own experience.

Of course I must not be understood to claim that tigers have no sense of smell. Some they have, though it is not acute, and an incident in the career of the man-eater already referred to proves this. My Head Quarters were at the time at a place called Gunjong in the North Cachar Hills, right away on the North-East Frontier of India where tigers—like he poor—were always with us. They often came near the house, more than once killed my animals in their stables and I had already killed one tiger within a stone's throw of my garden. On the occasion referred to, a tiger had two nights running passed along by the narrow path on the

crest of the hill just outside my garden fence, the tracks showing that he had come in the early night and returned in the very early morning. I accordingly determined to sit up and see whether he would not come again a third time but as there were no trees suitable for mychauns I arranged to squat under the shadow of a very big, very dense orange tree where there was just room to sit upright and move one's rifle round in a circle. Unfortunately it was a pitch dark night and though the tiger came and remained within easy shooting distance of me for at least an hour I never saw anything to shoot at. The one gap in the fence in front of me had a big white post against which anything passing must have shewn up but this was carefully avoided. On one side of me and about fifteen yards to the right was a very massive hedge of bougainvillea and most of the hour the tiger entertained me with an endless walk backwards and forwards behind this. He knew something was wrong somewhere but what he could not decide; every now and then I could hear him put his nose to the ground and draw deep breaths in the attempt to get my scent, then he would once more resume his walk, the soft pad, pad of his feet hardly audible in the intense stillness unless a dried leaf or brittle twig betrayed his movements. Every now and then he would make a little whimper a sound I have sometimes heard tigers make when hungry, and less often, he would give vent to his impatience in a long drawn, "a-a-a-ough."

He could not possibly have seen me and I made no sound so in this instance it must either have been his sense of smell which warned or else that uncanny extra sense which so many animals seem to possess of the vicinity of danger.

Eventually he cleared off the way he came, and I went off to bed to be awoke the next morning just after day light by two sweating frightened men who came to tell me that this tiger had killed their companion about two miles from my bungalow. I went out at once but failed to get him and after this he killed with the greatest regularity, disposing of 52 people in eight months before I finally shot him.

This tiger, all through his career, as far as we could ascertain, killed by sound alone or by sight and sound; his boldness was extraordinary and he would enter huts and villages in broad daylight and pull people out, but his usual habit was to lie up beside a village path in some patch of grass or jungle, much too dense to see through, and leap out on any one he heard passing. His caution, however, was just as great as his boldness and he would never face any risk he could avoid or run any danger he did not understand. He had no objection to charging out upon a crowd of men whose advent, as they approached his hiding place, had been heralded by the patter of their feet and the sound of their voices, but if some of them turned and faced him he never tried conclusions with them.

On the morning following the night I sat up for him in my garden, he attacked two men who, as is usual, with hill-men, carried spears and daos. They saw him as he charged up a steep hill at them and when he had got within a couple of paces of them dashed their spears in his face upon which he immediately turned tail and bolted. The next three men who passed that way a few minutes later ran when they caught sight of him and the slowest was promptly caught and completely eaten within the next three hours.

Three or four times I saw this man-eater when I was unprepared for him and each time he seemed to be depending mainly on sound for his preliminary charge and it was only at the last moment, on catching sight of something unusual, he repented and cleared off. My large white, or khaki-coloured sola-topee always seemed to scare him terribly and I have



no doubt that more than once his superstitious dread of this unknown object saved my life; indeed on one occasion I passed within inches of where he was lying and knew nothing of it until I had passed some paces when with a "woof" he jumped up and bolted. I had had to follow him up into some long grass by means of one of the tunnels in it made by deer and other game and up which he had dragged the body of a man he had killed. When I reached the remains of the body I found the tiger had retraced his steps and then leaped on one side, probably on hearing my approach. I suppose my whole attention was so concentrated on the expected tiger in front of me that I was oblivious to anything on either side of me, but it was a lesson never to be forgotten and in the many times afterwards in which I had to follow him up I always remembered to keep a very sharp look out on both sides of me as well as in front.

I saw an excellent example once of the want of scent possessed in a tiger, who was drinking at a stream, within ten paces of a sambhur with the wind blowing in fitful gusts from the deer to the cat. We were poling down the Diyung River in a dugout, a dense mist driving up the stream into our faces and completely obscuring both banks except at odd moments when the wreaths blew on one side. I was sitting on the edge of the boat, my legs dangling in the water and a shot gun on my knees waiting for the mist to rise and give me a chance of shooting my grub for the day, when the mist suddenly curled away from the bank and gave me a glimpse of a grand tiger, his head between his paws as he lay on the edge of the bank lapping his morning drink. Next second the rapid stream had swung us round a bend of the river and there stood a Sambhur Stag, head n air, evidently troubled by some faint whiff of his striped foe so close to him. The rifle I had snatched up too late for the tiger was in time for the deer who dropped where he stood with a shot through the neck. When we brought the boat to the bank and investigated matters more closely, we found that tiger and deer had been well within ten yards of one another although separated by a very dense strip of reeds and grasses. The tiger certainly appeared to have had no hint of the presence of the deer though the wind was in his favour, whilst the deer, almost equally certainly had been disturbed by the presence of the tiger, though the wind was against him.

Tame, or semi-tame, leopards which I have had in captivity have never shewn any great powers of scent, although some of them were allowed considerable liberty. Whilst my dogs would come up to me at a run when tracking me by scent, the leopards would nose about, snuffle and inhale and often fail altogether to find me out. Bears, which I have had at the same time as leopards, were much keener nosed and though clumsy in their movements would soon hunt me out. On the other hand the leopard was the quickest at hearing of all my animals, even sambhur and barking deer were not half so quick.

After the leopard had had a good meal it was often possible to allow him off his leash with the other animals, who curiously enough never showed the instinctive fear of him one would have expected, and often I have been able to compare their powers of hearing and invariably the leopard was the first to hear any sound with the occasional exception of a little prick-eared Tibetan dog.

The first sound, which to my human ears, used to convey the news that any one was approaching my compound was the creaking of a bamboo gate which let them into it, but long before this the animals knew all about it. First the leopard would prick up his ears, raise his head, and stare, with that curious far away look in his pale eyes, in the direction of the new-arrival, next the deer would erect their heads, stamp with their

forefeet and also turn in the same direction and lastly the dogs would show that they too had heard. The bears and monkeys never seemed to take any notice unless the person was approaching about meal time, but even then they were the last to pay any attention.

Unlike the true cats, the civet cats have an extraordinary powerful sense of smell. I once had a beautiful grey beast brought to me by some Nagas late in the evening as it was getting dusk. They asserted that it was absolutely tame so I took it out of the basket and it at once licked my hands and climbed over me uttering a sound like a contented little purr. I kept it with me for about an hour and then wanting to go to bed decided to lock him up in an old aviary I had once used for some eagles. Leaving it, as I thought, safely shut up, I turned in, but hardly was I in bed before I heard a scratching at the thatch roof and presently down dropped the civet, pushed itself cheerfully through my mosquito net and evinced the greatest delight at having once more found me. Feeling that it was hardly a desirable bed companion, I again grabbed it by the neck and carried it out to the cage. Shut up once more it was out, however, and back in my bed almost as soon as I was. Determined to be allowed to sleep in peace I again carried him right away out of the garden to a huge cotton tree about 200 yards away and saw him run safely up into the top branches far overhead, but, before I got back to my garden, I turned to have a look and there was my recently acquired pet with its nose to the ground simply racing over it after me.

This cat would often nose out birds' nests in trees or bushes within a few feet of the ground and then climb up and devour any eggs or young contained in them. When he arrived at a bush with a nest in it he would halt for a second or two with his little nose lifted up and quivering about in every direction until it was in a bee-line with the nest and then up he climbed. Fortunately he was the most amenable animal to deal with I have ever had and soon learnt that no nests within my garden fence must be touched. He was immense pals with all the dogs and could track them up by scent at a gallop, proceeding in ungainly leaps after the manner of his kind. His sight for distant objects was very poor though for anything near it was exceptionally quick.

Before leaving the subject of feline senses it may be of interest to relate a story of a leopard child which has not yet ever been published though it was pretty well known at the time.

In the North Cachar Hills, where the boy was found, Government taxation used to consist in part of labour, so much being supplied by every village for the upkeep of roads, rest-houses, etc. Sometimes men would petition for exemption from this labour on various grounds, and one day when questioning a man as to why he wanted exemption from such labour he told me that he had a little "wild" son to look after and as his wife had recently died he could not leave the village to work or the boy would run back to the jungle.

I accordingly went outside the court to see the "wild child" and satisfy myself as to the truth of the story. There sure enough outside was a small boy about seven years old, or less, squatted on the ground like a small animal; directly I came near him he put his head in the air and snuffed about, finishing by bolting on all fours to his father between whose legs he backed like a small wild beast retreating into a burrow. Looking closer at the child I saw that he was nearly or entirely blind from some form of cataract and his little body was covered with the white scars of innumerable healed tiny cuts and scratches. Struck with his appearance I asked the father to tell me all about the boy and he then narrated the following wonderful story which I fully believe to be true, but which my readers must accept or not as they think fit.



It appears that about five years before I saw father and son, the Cachari villagers of a village called Dihungi, had found two leopard cubs close to their village which they killed. The mother leopard had tracked the murderers of her children back to the village and had haunted the outskirts for two days. The third day a woman cutting rice in some cultivation close to the village laid her baby boy down on a cloth whilst she went on with her work. Presently, hearing a cry, she turned round and saw a leopard bounding away and carrying the child with it. The whole village at once turned out and hunted for leopard and baby but without success and finally they were forced by darkness to leave the boy, as they supposed, to be eaten by the leopard.

Some three years after this event a leopardess was killed close to the village by a sportsman who brought in the news of his success together with the information that the leopard had cubs which he had failed to secure. On hearing this the whole village turned out and eventually captured two cubs and one child, the boy of this story. He was at once identified by his parents, claimed by them, and their claim admitted by the whole village.

Subsequently when visiting Dihungi I interviewed the head man and also the man who actually caught the child and they both corroborated the father's tale in every detail. It appeared that at the time he was caught the child ran on all fours almost as fast as an adult man could run, whilst in dodging in and out of bushes and other obstacles he was much cleverer and quicker. At that time he was only suffering from cataract to a slight extent and could see fairly well, but after he was caught his eyes rapidly became worse. His knees, even when I saw him and when he had learnt to move about upright to a great extent had hard callosities on them and his toes were retained upright almost at right angles to his instep. The palms of his hands and pads of toes and thumbs were also covered with very tough horny skin. When first caught he bit and fought with every one who came within reach of him and, although even then affected in his eyes, any wretched village fowl which came within his reach was seized, torn to pieces and eaten with extraordinary rapidity.

When brought before me he had been more or less tamed, walked upright except when startled into extra rapid motion, was friendly with his own villagers, whom he seemed to know by scent, would eat rice, vegetables, etc., and consented to sleep in his father's hut at night. Clothes, being a Cachari child of tender years, he had not been introduced to.

His blindness was not in any way due to his treatment by the leopard—if the story is true—as I found that another child, a couple of years older, and the mother also had both had the same cataract. At the same time the defective sense of sight may well have intensified his sense of smell as the loss of the one must have caused him to rely more on the other. When caught the child was in perfect condition, thin but well covered, and with a quite exceptional development of muscle.

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## SOME SOUTH INDIAN BATRACHIANS.

BY

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[With two plates.]

These notes discuss a portion of the material collected some time ago in certain parts of Coorg and Shimoga, and I propose to include in this paper a few remarks on some of the unidentified examples of batrachians belonging to the Bombay Natural History Society, entrusted to me for determination. Through the courtesy of Dr. N. Annandale I have had access to the named collection of amphibians in the Indian Museum, and I should like to thank him and Dr. Boulenger who has very kindly examined a few specimens submitted to him for his opinion.

Two specimens belonging to the species *Spelerpes fuscus* are contained in the Society's collection and the label on the specimens shows that they are from Burma. There are a few points in which these two examples differ from the description of *fuscus* given in the Catalogue of the British Museum. For instance, 1. The remnants of cirri or balancers are absent below the nostrils in both the specimens. 2. The distance between the snout and the gular fold is less than three times in the length of the snout and the vent. 3. Two parotoids are present in both examples. 4. The deep groove behind the gular fold is continuous with the cervical groove starting from the posterior angle of the eye. 5. A lateral glandular fold over the costal grooves (9-10) is present. 6. Total length from tip of snout to tip of tail 105mm., more than 4 in. (a) 7. The tail is marbled. Considering the locality that the specimens are alleged to come from and also in view of the fact that the characters enumerated above are constant in the two forms, I naturally thought whether they could not be distinct from *fuscus*. But Dr. Boulenger who has examined one of the specimens, identifies it as the European *Spelerpes fuscus* and states that it could not have been picked up in Burma. (b) The only species of *Spelerpes* present in the Indian Museum is *S. ruber*, No. 2712 from North Carolina, and there is practically no further material in India for comparison. As the source of these salamanders cannot be definitely traced for the present, the interpretation of Dr. Boulenger is certainly the more natural and correct one.

Among the unidentified examples of batrachians belonging to the Society I found 1. *Rana pileata*, 2. *R. plicatella*, 3. *R. erythræa*, 4. *Rhacophorus bimaculatus*, 5. *Galophrynus pleurostigma*, 6. *Kaloula pulchra*, 7. *Bufo melanostictus*, 8. *Leptobrachium hasseltii*? All these are from Burma, except *Rh. bimaculatus* which I found in Mr. Kinnear's collection from Somavarapatna, Coorg. The occurrence in South India of this species which is known to affect the rain forests of Assam is certainly very interesting and is reported here for the first time. The two specimens of *Cal. pleurostigma* are in a beautiful state of colour preservation and the scheme of markings on them closely conforms to the description of

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(a) Dr. Boulenger's measurement for the male specimens is 96mm, and Dr. Gadow (Camp, Nat. Hist. Amp. Rept., p. 105) states that the total length of *fuscus* remains under four inches.

(b) The only two salamanders known from this region are *Tylototriton verrucosus* and *Amblystoma persimile*.



*Engystoma interlineatum* (c) rather than Boulenger's account (d). The ventral surface bears in both the examples beautiful white roundish or squarish spots, not alluded to by any previous writers and such as are present in some species of *Megalophrys*.

Only the following examples of batrachia included in my collection call for observation at present.

*Rana hexadactyla*, Less.

1890. *Rana hexadactyla*, Boulenger, Faun. Brit. Ind. Rept. Batr., p. 441.

*Larva*.

1904. *Rana hexadactyla*, Fergusson, J. B. N. H. S., Vol. XV., p. 500.

A young specimen measuring 23 mm. taken in Jog, Shimoga Dist., shows the following peculiarities as compared with examples of similar size.

1. The strong fold of skin behind the eyes and across the head is continued over the tympanum on each side.
2. Pearl-like granules crowd over the body and the limbs and toes
3. First finger equals the second.
4. A very distinct canthus rostralis.
5. Nostrils with valve-like flaps.
6. The tibio tarsal articulation reaches beyond the eyes

This specimen has been sent to the Indian Museum.

*Rana tigrina*, Daud.

1890. *Rana tigrina*, Boulenger, Faun. Brit. Ind. Rept. Batr., p. 449.

1915. *Rana tigrina*, Nicholls, Proc. Zool. Soc. London, pp. 603, 609.

1917. *Rana tigrina*, Annandale, Mem. As. Soc. Bengal, Vol. VI, p. 112.

1918. *Rana tigrina*, Id. & Boulenger, Rec. Ind. Mus., Vol. XV, 51, 67.

*Larva*.

1904. *Rana tigrina*, Ferguson, J. B. N. H. S., Vol. XV, p. 501.

1917. *Rana tigrina*, Annandale, Mem. As. Soc. Bengal. Vol. VI, p. 125.

The variations observable in this species are quite striking and are associated with the different modes of life adopted by the individual members. In the Mysore State, *e. g.*, Bangalore as in Madras town both this species and its variety *crassa* occur together and though both are of robust build their powers to stand captivity are so small, that any prolonged observations on their habits in a vivarium becomes almost impossible. My own experience is that the fossorial habits are by no means confined to *crassa* and I have on several occasions exhumed specimens of *tigrina* S. S. while digging for earthworms. The presence of a horny plate on the roof of the mouth or on the sides of the lower jaw of the larvæ is purely arbitrary and indicates nothing. In my opinion it would not be perfectly safe to use this character as a basis for specific or racial distinction. The dental formula ascribed to the tadpole by Dr. Annandale (e) does not provide for the outer limits of variations and the description of Dr. Boulenger (f) would be correct if the formula is written thus, 1 : 3 or 4/3 or 4 : 1.

The osteological characters of *Rana tigrina* recently described by Dr. Nicholls would appear to be subject to a great deal of variation and the following description refers to the more important of them. He compares the vertebral column of the Indian bull frog with that of the European

(c) J. A. S. B., 1854, Vol. XXIII, P. 732,

(d) Faun. Brit. Ind. Rept. Batr., 1890, p. 490.

(e) 1917, Mem. As. Soc., Bengal, Vol. VI., p. 125.

(f) 1918, Rec. Ind. Mus., Vol. XV., Part II, 57.

*R. temporaria*, and Dr. Annandale (*g*) states that he has been able to confirm the observations of Dr. Nicholls on most of the bones by an independent examination. In South Indian colleges where practical zoology is taught, the laboratory type is *R. hexadactyla*, and during the breeding season of frogs, examples of *R. tigrina* are frequently brought to the class for practical work. The skeleton of a *R. tigrina* S. S. prepared for the Central College recently showed certain abnormal individual variations and led to the making of a large series of skeletons of this species for the purpose of comparison. On a careful examination of these series with the skeletons of *R. hexadactyla* and *R. cyanophlyctis*, I am not able to confirm some at any rate of the statements of Dr. Nicholls.

(*a*). The vertebral column:—In regard to the neural arches, *R. tigrina* is said to show, “a very marked overlap of each arch dorsally upon that immediately posterior to it and accordingly when the vertebræ are in position, the centra are not visible from above (*h*)”. “In this imbricate condition of the vertebral column, it would appear then, that *R. tigrina* has retained (or reverted to) a somewhat primitive condition (*i*)” such as is met with in the families of *Discoglossidæ* and *Pelobatidæ*. The condition, shown in text fig. 1 of the paper cited, in support of the above statement, is easily produced by a bend or flexure such as appears in badly prepared skeletons, (*j*) and ; however, in carefully prepared bones the neural arches only notch between the zygapophyses (*k*) so as to produce a more or less open-work condition that Dr. Boulenger (*l*) describes as being characteristic of the genus *Rana*. I possess two skeletons of *R. esculenta* and a comparison with them or with the two other Indian species already mentioned, discloses nothing strikingly different in the vertebral column of *tigrina*. I may further mention that its vertebral column is certainly not like that of *Discoglossus pictus* (*m*) and the figure of Dr. Nicholls therefore does not represent the correct position of the neural arches in well prepared and normally articulated spinal column. It is further pointed out that the imbricate condition of the neural arches is produced in *tigrina* as in *Pelobates fuscus*, by the fact that in these examples the centrum has practically the same length as the neural arch (*n*). In the vertebræ of *R. tigrina* that I have forwarded to Dr. Annandale, the length of the centrum is  $1\frac{1}{5}$  of the length of the neural arch measured along the median line. This holds not only for the sixth vertebra that Dr. Nicholls selects for comparison, but for all others in the series. The dorsal view of the vertebral column of *R. tigrina* is not, however, the fully and completely open-work condition figured for *R. temporaria* by Howes (*o*) and for *R. esculenta* by Ecker, (*p*) and the seemingly imbricate appearance is due to,—1. The largely developed neural spines, directed backwards hiding the vertebral gaps. 2. The pre and post zygapophyses are considerably flattened and hide the communications between the dorsal gaps and the vertebral foraminae, and 3. On the posterior border of the neural arch of some of the vertebræ, a flange or arcualium is developed.

(*g*) 1917, Mem. As. Soc., Bengal, Vol. VI, p. 124.

(*h*) 1915, Proc. Zool. Soc., p. 603.

(*i*) 1915, *ibid.* pp. 603-604.

(*j*) All osteological material in support of these statements are sent to the Indian Museum.

(*k*) This is true of *R. hexadactyla* and *R. cyanophlyctis* also.

(*l*) 1897, the Tailless Batrachians of Europe, Vol. I, p. 38.

(*m*) 1907, Wiedersheim and Parker Comp. Anat. Vert., p. 56.

(*n*) 1915, Proc. Zool. Soc., London., p. 605.

(*o*) 1902, Howes, Atlas Pract. El. Zool., pl. IV., fig XXXV.

(*p*) 1889, Ecker. Anat. Frog., p. 18.



In regard to the development of the neural spines, I agree with the statement of Dr. Nicholls (p. 606) and I find that the neural spine of the seventh vertebra is as upright as that of the eighth. The cartilaginous ribs of the third vertebra of *R. tigrina* are said to be very like those of *P. fuscus* and this condition is obviously common to more than one Indian frog. The third vertebra of some of the examples of *hexadactyla* also show this character and the third vertebra of these two Indian species are to be distinguished by a flange or an osseous tubercle in *tigrina* alone. This tubercle or flange may perhaps represent the partial bifurcation of the diapophyses described by Dr. Bourne (q) as an abnormal occurrence in *temporaria*. As regards the diapophyses of the eighth vertebra, it may be mentioned that its stouter nature is rather an exception than a rule, and in the specimens that I have sent to the Indian Museum they will be seen to be not bigger than the transverse process of the seventh vertebra. The sacral diapophysis is certainly cylindrical in *tigrina*. I entirely agree with the description of the coccyx in Dr. Nicholls's paper, but in respect of the shoulder girdle, although there is a slight overlap, the ventral suture of the two coracoids which meet in a median bar in front, passes through the median axis of the girdle. Dr. Nicholls's text fig. 3A showing the right coracoid beyond the mid-ventral line, is rather an exaggeration. The overlapping condition is certainly a primitive feature which *tigrina* has retained, and in the metamorphosing larvæ of this, as in other Ranid larvæ (r) it is the epicoracoidal cartilages that overlap and the left coracoid bone extends slightly dorsally over the right, while ventrally they meet in a median suture.

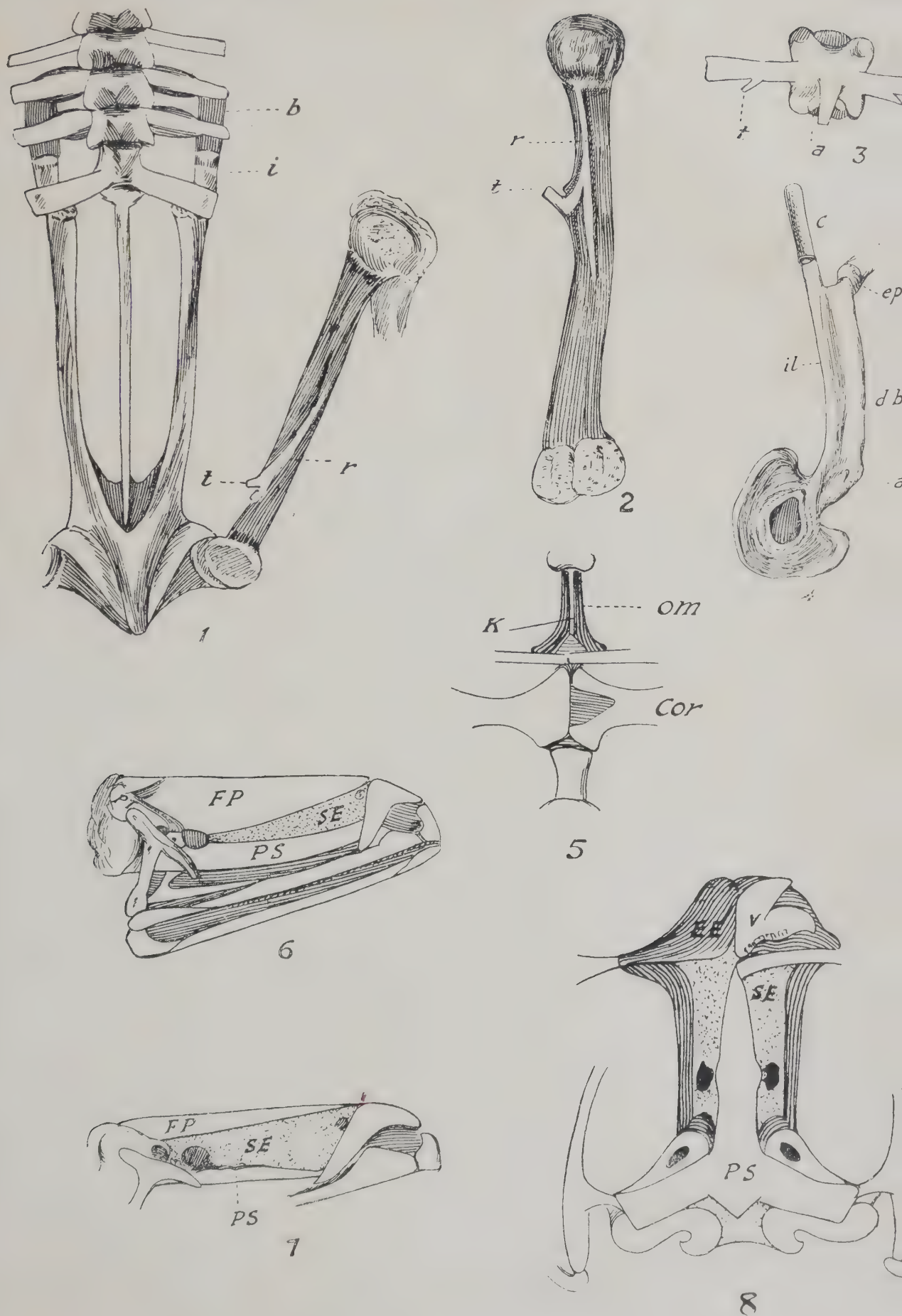
(b). The skull:—Dr. Boulenger appends a short description of the skull of *R. tigrina* to his definition of the species (s) and in certain regards it needs amplification. The cartilaginous basis of the skull is really confined to the processes given off from the nasal capsule which is, however, perfectly ossified; the principal processes being the transverse ones meeting the cartilaginous epiphyses of the pterygoid, the anterior and the anterolateral and the alar cartilages. The floor, the roof and the septum of the olfactory capsule are ossified by the great development of the othmoid bone—the cornets are present in the form of powerful turbinated bones. The large nasals which overlie the bony capsule,—occasionally with bony outwardly a very short directed spines,—are united with one another and with the frontoparietals so completely that the sutures may be lost or may be faintly indicated by grooves. The osseous floor of the nasal capsule is underlaid by two equally large vomers the outer borders of which have two processes enclosing a deep notch between them,—the anterior process almost meeting the maxillary bone, while teeth are borne on the postero-lateral border. The sagittal and coronal sutures are only indistinctly marked or not at all, and the upper surface of the skull is either flat or slightly convex (noticed in *R. temporaria* and *R. oxyrhinus* (t)). The parietal ridge is generally strongly marked, extending backwards to the apex of the heart-shaped foramen magnum. The mastoid ridges and the mastoid elevations are prominent. The lateral cartilaginous portions of the cranium are completely replaced by the backward extension of the sphenethmoid which is incorporated behind into the ala magna. Thus the foramen pro ramo-nasalis, foramen opticus and foramen oculomotorius are simple perforations in the sphenethmoidal bone. In some specimens the downward prolongation of

(q) 1894, Bateson, Mat., Stud. Var., p. 124, and 1884, Bourne, Q. J. M. Sci., XXIV, p. 86.

(r) 1901, Gadow., Camb. Nat. Hist., Amph. Rept., p. 25.

(s) 1918, Rec. Ind. Mus., Vol. XV., p. 57.

(t) 1889, Ecker, Anat., Frog. p. 23.



SOUTH INDIAN BATRACHIANS.





the fronto-pariels may meet the upward extension of the parasphenoid in front of the exit of the optic nerve. The foramen trigeminus is a large vertically oval aperture and in some specimens of skulls, is constricted slightly in the middle by the approximation of tongue-like processes of the sphenethmoid and the ala magna. The ophthalmic branch of the fifth, the sixth and the palatine branch of the seventh occupy the dorsal part of the foramen, while through the lower half of the foramen emerge the maxillo-mandibularis of the fifth and the hyo-mandibularis of the facial nerves. The trochlear nerve has no separate exit and issues through the foramen opticus. The canalis nervi vagi may bear three orifices,—though the usual number is only two,—the internal foramen condyloidium for the exit of the vagus and glossopharyngeal nerves and two lateral ones for the entry of the internal and the external carotid arteries. The maxillo—palatine process is large and extending below the nasals, supports the cartilaginous epiphyses of the pterygoid and the transverse cartilaginous extension from the nasal capsule.

(c). The individual abnormal variations.—

i. The pelvic girdle. In the preparation I have forwarded to the Indian Museum the ventral border of the ilium extends far beyond the sacral diapophyses and before maceration, was continued over the transverse processes of the eighth and the seventh vertebræ by means of a flat cartilaginous bar. In accordance with this fact the diapophyses of these vertebræ are flattened into wing-like expansions at the base, thus deviating from the cylindrical shape. The dorsal blade of the ilium is practically of the same depth throughout and it is the terminal portion of this sharp border, which unites with the transverse process of the sacral vertebra by a cartilaginous epiphyseal connection.

ii. The femur. The inner border of the right femur bears a strongly developed tubercle or a process projecting in the living specimen between the great adductor and internal vastus muscles. There is a distinct ridge on the ventral surface of the bone, running from the head of the femur to more than half the distance. A similar but fainter ridge is found on the dorsal face also.

iii. The pectoral girdle. The inner end of the left corocoid is distinctly forked and a mass of epicorocoidal remains persisted in the living condition, in front of the corocoidal suture. The future is imperfect on account of the deficiency of the left corocoid. The ventral face of the bony style of the omosternum bears a strong carina-like ridge throughout its length.

*Rana leptodactyla*, Boul.

1890. *Rana leptodactyla*, Boulenger, Faun. Brit. Ind. Rept. Batr., p. 448.

• Larva.

1918. *Rana leptodactyla*, Annandale, Rec. Ind. Mus., Vol. XV., p. 19.

I have had opportunities of witnessing the spawning of this frog in Coorg and could rear the larvæ only up to the two-legged stage. I am of opinion that the tadpoles described by Dr. Annandale in the paper cited, do not belong to *R. leptodactyla*. I have myself examined the tadpoles No. 17698 contained in the Indian Museum collection, and I have in my own collection other tadpoles quite identical with this number, a few of these latter tadpoles with me have developed the feet. Judging from this and other characters I am led to infer that the examples described under *leptodactyla* may prove to belong to one of the species of *Nyctibatrachus*. I am forwarding



to Dr. Annandale these suspicious looking larvæ and other material, and at present I am not in a position to say anything regarding the larvæ he describes under *N. pygmeus* (u).

The eggs of *R. leptodactyla* are large, measuring with the gelatinous outer coat  $4\frac{1}{2}$  mm. and are laid in small clumps at several places along the grassy margins of the ponds. The sexual embrace is axial. The total number of eggs included in any one batch does not usually exceed thirty, and the batches of eggs deposited by any one frog in the different parts of the same pond may vary from six to eight. The localities for spawning are most arbitrarily selected and have no reference to protection or development being ensured. The *debris* that usually collects round the margins of ponds fed by storm-water confers, however, some measure of protection. The gelatinous outer envelope of the eggs which swells out into a large spherical mass in the water, shrinks in the preserving fluid. The two poles of the eggs are not distinguished by any colour.

The tadpoles are of moderate size, oval, rather flattened above (elevated in the young). The ventral surface is convex. The snout is obtusely pointed. The nostrils are widely separated, nearer to tip of snout than to eyes. The inter nasal space is only half the inter orbital width. The eyes are dorsal and directed upwards in the young, but outwards in the older forms. Eye nearer to the snout than to spiracle. The spiracle is lateral, not visible from above, sinistral, tubular, pointing backwards and upwards. It is nearer to the root of hind leg than to tip of snout. A frontal gland is present. The mouth disk is moderate, ventral in position. Lips opposible, the lower fringed with a double row of fingers-like processes, which extend on the emarginate sides. The upper beak is broadly semilunar, produced more or less in the middle into a blunt tooth-like process. The lower beak is V-shaped and the margins of both the beaks are entire. The dental formula is  $1: 2 + 2/1 : 2$  or  $3$ . The upper entire tooth row is the longest and the other two are broadly interrupted. The innermost lower series is either narrowly broken or entire and all the three series are equally long. The vent is dextral, tubular. The tail is long, pointed at the tip. The muscular part at the middle of tail is as deep as the membranes,—these are poorly marked in front but are deep and convex behind. The dorsal surface of head and body is olive green or brown, more or less speckled. The ventral surface whitish, immaculate. The tail is spotted throughout.

Measurements of a specimen in which the hind limbs are fully grown:—

Total length	.. ..	43mm.
Length of head and body	.. ..	18mm.
Greatest breadth of body	.. ..	11 1/2mm.
Greatest depth of body..	.. ..	10mm.
Greatest debth of tail ..	.. ..	7mm.

The eggs and specimens of tadpoles were obtained at Watekolle, Coorg, in December 1918 and were taken also in Shimoga, Mysore State. Twelve hours after the deposition of the eggs, the young one are found wriggling in their gelatinous envelopes, which gradually spread out into a continuous film over the water. This viscous mass becomes completely dissolved, before the final emergence of the larvæ takes place. Buds of hind limbs sprout nearly a fortnight later, which is certainly a remarkably short period for the Ranid larvæ in general and the rapidity in the present case is correlated with the fact that metamorphosis has to be completed before the element in which the larvæ live should dry up.

The eggs and the tadpoles are in the Indian Museum.

*Nyctibatrachus sancti-palustris* sp. nov.

Vomerine teeth in two strongly set, large oblique series, behind the choana, —considerably further behind in the young. Habit moderate. No canthus rostralis, which in the young is obtuse. Length of snout nearly equals the diameter of the eye in the adult, but longer in the young. Eyes moderately prominent, directed upwards and forwards. The upper eye lid is narrow and smooth in the young and covered by warty folds in the adult. The inter orbital space is slightly wider than the upper eye lid. Nostrils equidistant between the eye and tip of snout. Snout obtuse in the young, broadly rounded in the adult. Fingers moderate, first shorter than the second; tips swollen, truncate. Toes more than half webbed, tips dilated into disks. Subarticular tubercles moderate. An inner metatarsal tubercle. Tarso-metatarsal articulation reaches the eye or slightly beyond. Skin nearly smooth in the young but covered by short semicircular folds on the back and the sides, in the adult. A median fold on the snout, forking behind in the adult, but generally continued between the eyes in the young. A moderate sub-orbital fold and another from the eye to the shoulder. Reddish brown above, limbs barred. A broad dark band between the eyes. Throat bronzed in the adult, as also the under surface of limbs. Abdomen yellow, the liver showing through the transparent skin in the form of a squarish dark patch. In the young, the upper surface of the limbs is lighter, the dark bands extend on the toes. A triangular bright yellow mark on the snout and orange yellow streaks on the shoulder, sometimes continued to the groin in the young.

From snout to vent 39mm.

Locality.—The sacred swamps of the Cauvery, Brahmagiri hills 4,000 feet, Coorg.

The type and syntypes are in the Indian Museum. Dr. Boulenger has retained for the British Museum one of the three specimens which he kindly examined.

*Nyctibatrachus sancti-palustris modestus* var. nov.

This variety of the foregoing species differs in a striking manner and in several important particulars and for the purpose of comparison, I have selected examples of the same size.

1. The length of the throat along the mid-ventral line is  $\frac{1}{2}$  the distance measured ventrally between the angles of the mandibles in *sancti-palustris*, and in *modestus* it is  $\frac{4}{5}$ .

2. The length of snout equals the diameter of eye in *modestus*, exceeds by far in *sancti-palustris* of the same size.

3. Nostrils nearer tip of snout in *modestus*.

4. The inter orbital width more than twice the upper eyelid in *modestus*.

5. No canthus rostralis.

6. A more elongate metatarsal tubercle.

7. Tarso-metatarsal articulation reaches the snout or slightly beyond. Toes less fully webbed.

8. Skin thrown into long longitudinal folds on the body and limbs.

9. Pinkish above, more or less blotched. Limbs barred. Throat and under surface of limbs finely speckled. Abdomen white. An orange yellow band on each shoulder.

Total length 25 mm.

Locality.—Jog, Shimoga, Mysore State.

Type and syntype in the Indian Museum.

*Bufo*.

Two specimens of *Bufo* collected in Coorg appeared to me to be distinct from *B. stomaticus* which I had examined in the Indian Museum in June



1919. Dr. Boulenger to whom they were sent is, however, of opinion that they cannot be separated from *stomaticus*. With a view to verify my position, I have, through the courtesy of the Director of the Zoological Survey of India, been enabled to re-compare my material with the Indian Museum collection. At the end of the reconsideration, I find myself unable to accept the decision of Dr. Boulenger. For reasons given below I consider myself sufficiently justified in regarding the two examples as representing a distinct local race differing from their North Indian congeners in several important particulars. Though I do not possess at present sufficient material to establish their specific distinctness, which may perhaps prove the more correct view to take, I have no doubt about their being racially distinct.

*Bufo stomaticus peninsularis* var. nov.

Head without bony ridges or feebly marked by minute cornified tubercles. Snout obtuse, rather truncated obliquely. Interorbital space broader than upper eyelid. Tympanum moderate about  $\frac{3}{4}$  the length of the upper eyelid. First finger equals the second. Toes half-webbed, subarticular tubercles inconspicuous. Two meta tarsal tubercles,—the inner spade-like. Tarso metatarsal articulation reaches the tympanum. Skin perfectly smooth or covered uniformly by minute tubercles. Under surface non-tuberculate. A feebly marked flask-shaped fold over the occiput. Parotoids much flattened, inconspicuous. Cutaneous pores aggregated in small numbers over the skin. Colour of live specimens either pale buff or olive green more or less speckled with brown. Under surface yellow on a background of dirty white.

From snout to vent 45 mm.

Locality. Mavkote and Watekolle, Coorg.

Type and syntype in the Indian Museum.

The enumeration of characters in which the variety *peninsularis* differs from *stomaticus*, (Indian Museum nos. 16067, 16068, 17254 and 17274) may now be proceeded with. They are all from Northern India. 1. The interorbital space is  $1\frac{1}{3}$  or  $1\frac{1}{4}$  of the upper eyelid in *peninsularis* and equals the upper eyelid in *stomaticus*. 2. The length of the snout is  $1\frac{1}{2}$  the length the upper eyelid in *peninsularis* and is  $\frac{5}{7}$  in *stomaticus*. 3. The mandibulars symphysis form an acute angle in *peninsularis* and is a broad semicircle in *stomaticus*. 4. Inner meta-tarsal tubercle spade like in *peninsularis* and conical is *stomaticus*. 5. The vertical diameter of the tympanum is  $\frac{3}{4}$  the length of the upper eyelid in *peninsularis* and  $\frac{3}{7}$  in *stomaticus*. 6. The upper eyelid is entire, coterminous with the canthus in *peninsularis* and notched both ends in *stomaticus*.

*Bufo parietalis*, Boul.

1890 *Bufo parietalis*, Boulenger, Faun. Brit. Ind. Rep. Batr., p. 507.

A single specimen of this species 1.8 inches (*y*) is included in the collection and shows the following peculiar characteristics:—

1. The bony ridges are by no means prominent.
2. There is a distinct occipital and a prefrontal ridge.
3. Toes are considerably less than half-webbed and subarticular tubercles are absent.

Specimen in the Indian Museum.

EXPLANATION OF PLATES.

1. The abnormal *Rana tigrina*.

Fig. 1. The pelvic girdle and the abnormal femur.

Fig. 2. The abnormal femur showing the tubercle and the ridge.

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(*y*) Dr. Boulenger's record is 3.25 inches, Faun. Brit. Ind. Rept. Batr., p. 507.

- Fig. 3. The third vertebra showing the tubercle on the diapophyses and the arcualium.  
 Fig. 4. The abnormal ilium with the forward cartilaginous extension.  
 Fig. 5. The pectoral girdle showing the forked left corocoid and the keeled omosternum.  
 Figs. 6&7. Side views of the skull of the normal *R. tigrina*, showing the relation of the sphenethmoid, the frontoparietal and the parasphenoid bones, and their degrees of development.  
 Fig. 8. Lower view of the skull shown in fig. 7. The right vomer is removed to show the bony base of the nasal capsule.

## 2. *Rana leptodactyla*.

- Figs. 9,10&11. Egg\* more than twice ; tadpole\* twice ; mouth\* more four times magnified.

## 3. *Nyctibatrachus*.

- Fig. 12. *N. sancti-palustris* sp. nov.  
 Figs. 13&14. The under views of *sancti-palustris* and *modestus* var. nov. respectively.  
 Figs. 15, 17 and 16, 18. The hind limb and the meta-tarsal tubercle of *sancti-palustris* and *modestus* respectively.

## 4. *Bufo*.

- Figs. 19, 21 and 20, 22. The throat and profile of *B. stomaticus* No. 17274 belonging to the Indian Museum and *peninsularis* var. nov.

Lettering.—a. Arcualium on the posterior border of the neural arch. ar. articular facet of the tendon of m. vastus externus.  
 C. cartilaginous bar extending over the transverse processes of the VIII and VII vertebræ.  
 Cor. corocoid with the forked end.  
 db. dorsal blade of ilium.  
 EE. ecto and mesethmoid bones.  
 ep. epiphyseal connection between the dorsal blade of ilium and sacral diapophysis.  
 FP. frontoparietal bone.  
 il. ilium. K. carina on the omosternum. om. omesternum.  
 PS. parasphenoid bone, r. ridge on the two faces of the femur.  
 SE. sphenethmoid bone. t. tubercle. v. vomer.



## THE BIRDS OF PREY OF THE PUNJAB

BY

C. H. DONALD, F.Z.S.

PART V.

(Continued from page 1020 of Vol. XXVI.)

TYPE G.

FAMILY FALCONIDÆ.

SUBFAMILY FALCONINÆ.

Genus CIRCUS.

No. 1233. *Circus macrurus*. The Pale Harrier.*Characteristics.*

Size medium, wing about  $14\frac{1}{2}$ " ; tarsi under 3" ; Outer web of 2nd, 3rd, and 4th, quills notched, but not of 5th.

*Colouration.*

*Adult male.* "Upper parts pale ashy grey, generally, except in very old birds, more or less tinged with brown on the crown, back, scapulars and quills ; lores whitish ; forehead and above and beneath the eye white ; ear-coverts pale grey streaked with white ; the ruff behind the ear-coverts differing in texture, but scarcely in colour. Primaries ashy grey, 3rd, 4th, and 5th, black or blackish-brown on part of the terminal half, some black on 2nd and 6th, the basal portion of all quills white ; upper tail coverts banded grey and white, middle tail-feathers grey unbarred, the others white, with grey bars ; lower parts white, throat and upper breast with a faint grey tinge" (Blanford).

*Adult female.* "Above brown, feathers of head and hind-neck broadly margined with rufous or buff, and the smaller wing-coverts with broad pale rufous borders ; forehead whitish, a buffy white supercilium and patch below the eye ; moustachial stripe and ear-coverts brown ; a well marked ruff of small white or buff feathers with broad brown shaft-stripes all round the neck, behind the ear-coverts, and across the throat ; quills brown above buff or whitish below, with blackish-brown cross-bands on both sides ; upper tail-coverts white, brown shaft-stripes or other markings ; middle tail feathers brown, outer feathers buff or rufous-white, all with dark brown cross-bands.

Lower parts white, with rufous-brown shaft-stripes, broadest on the breast ; in old birds these stripes become very narrow, especially on the abdomen and lower tail-coverts.

Young birds resemble the female above, except that the feathers have, at first, rufous edges throughout, there is a white nuchal patch with

throughout, there is a white nuchal patch with brown shaft-stripes, and the ruff is unstreaked, or almost unstreaked buff and very conspicuous; the upper tail-coverts are white, the lower parts throughout are rufous-buff, with faint shaft-stripes. There is a gradual passage from this plumage into that of the adult; nearly adult males are often found with patches of brown on the crown and brown shaft-stripes on the breast" (Blanford). "Bill black; cere greenish; iris yellow in adults brown in the young; legs yellow." (Blanford).

#### *Measurements.*

Length of females about 19·5; tail 10; wing 14·5; tarsus 2·9. Length of males 18; tail 8·75; wing 13·75; tarsus 2·7.

I have given the above description of this bird in full, from the Fauna of British India, as it very nearly applies to the next species also, and because I have noticed that these two birds are very frequently taken for each other. In his description of the next species, the Hen-Harrier, Blanford merely gives the difference between it and the present species, so there should be no confusion between them. If it is remembered, in the first instance, that one glance at the wing of the bird, without looking at the plumage at all, is sufficient to keep the two species apart, it would save a great deal of trouble and leave no room for doubt. In the Pale Harrier the 5th quill is *not* notched, whereas in the Hen-Harrier the 5th quill is notched. Secondly, look at the upper tail-coverts.

In the Pale Harrier these are always streaked with brown, or edged with brown or buff. In the Hen-Harrier the upper tail-coverts are pure white in both sexes.

#### *Habits, etc.*

The Harriers, as a genus, are well known birds and unmistakable as such. Their curious habit of flying low over grass or scrub jungle and dropping silently to the ground, or for a second almost stopping still in mid-air, and then continuing their flight over another bit of grass or scrub is unlike any other Bird of Prey.

All the Harriers appear to do a great deal of work to earn their dinner for it is seldom that one gets a big enough meal in one quarry to satisfy it. Fortunately it is not averse to taking almost anything it can get, from grass-hoppers and insects of all kinds to lizards, mice and birds, but it seldom loses an opportunity of trying for birds when it gets a chance. The writer watched a male of this species, on one occasion, trying for little birds for the better part of two hours, over a dried up water course, overgrown with bullrushes and grass. The water-course was some 3 to 400 yards long and about 30 feet wide; the centre was clear of weeds which only grew on either bank. The Harrier started at one end, flying very slowly and checking at frequent intervals, pre-



paratory to dropping, but each time it did so a few birds would hurry out and drop back into the weeds a little further on. Time after time the Harrier turned and twisted, swooped and rose and its legs were over and over again seen to shoot out as a bird came within striking distance, but each time it missed its prey by inches. Up one bank and down the other it went, times innumerable, but did not succeed in getting a single bird. There was a wide open plain on either side of the water-course and the birds which had taken shelter among the weeds appeared to be very loth to leave it, for they merely flew, when the Harrier got directly above them, for a short distance and went into the rushes again a little further on, only to be flushed again.

The flight is light and graceful but slow, a bout of flapping being followed by sailing and frequent "banking" as the bird half turns from one side to the other, as though unable to make up its mind as to which side it should go. Harriers generally are not very often seen soaring in the winter, but during their bi-annual migrations they may frequently be seen circling high up in the air.

When circling the wings are held very nearly in line with the body, though slightly upwards inclined. Whilst flying over scrub, *i.e.*, when hunting, the wings are frequently seen to be held well over the plane of the body for short distances. The tail is long and projects well beyond the line of the wings and the bird somewhat resembles a Goshawk, but the wings are relatively longer and narrower.

The Pale Harrier is a winter visitant to India and nothing is known of its nidification in this country.

On the wing this species can generally be distinguished from the Hen-Harrier by its marked upper tail-coverts, if the back can be seen and in the case of the male by its lighter under parts, as well as the tail-coverts. In the Hen-Harrier a bluish-grey marking will be noticed on the chin and upper breast, whereas this is wanting in the Pale Harrier in which the chin and upper breast are, at most, a very pale grey.

No. 1325. *Circus cyaneus*. The Hen-Harrier.

*Characteristics.*

Size medium, wing about 14"; tarsi under 3"; outer web of 5th quill notched.

*Colouration.*

*Adult male.* Very similar to the preceding species, except that the general colouration is somewhat darker, being a more bluey grey, especially on the upper breast and throat. "There is a distinct white nuchal patch with brown shaft-stripes."

*Upper tail-coverts are pure white.*

"The adult female is distinguished from that of *C. macrurus* by having the margins of the head and neck-feathers more rufous, by the rufous markings on the wing-coverts and scapulars being larger and

more in the form of spots, by the white around the eyes being more sullied, and the moustachial stripe and ear coverts being rufous with dark streaks instead of uniform brown, and by the upper tail-coverts being pure white. The ruff is well marked. Young birds have the lower parts buff or pale rufous, with distinct broad shaft-stripes and the ruff, though distinct, is always striated."

"Bill black; cere yellow; iris yellow, brown in the young and according to some observers in females; legs and feet yellow" (Blanford).

*Measurements.*

"Length of male about 18"; tail 9; wing 13; tarsus 2.75. Length of female 21; tail 10.5; wing 15; tarsus 3" (Blanford). N. B.—Usually the tarsus is just under 3".

*Habits, etc.*

This bird can at all times be separated from *C. macrurus* by its pure white upper tail-coverts and by having its fifth primary notched. The iris of the adult female is yellow, so far as I have seen though in the young bird it is brownish.

The Hen-Harrier is a winter visitor to the Punjab and to be found throughout the Province, during that time. Very like the Pale Harrier in its habits, mode of hunting and flight, but I think, somewhat more given to soaring than the latter. During the spring and autumn it is found at great heights and I have come across him at 15,000 feet and over, beating over the barren hill-sides and chasing accentors and finches.

The adult male can generally be recognised by the darker colouring on the breast, throat and chin in particular, and both sexes by the pure white upper tail-coverts.

Nothing is known of its nidification in the Province and I certainly have never met with this species, even in the higher Himalaya, during the summer months. Blanford states that it has been known to breed at Tso Morari in Thibet.

1237. *Circus cruginosus*. The Marsh-Harrier.

*Characteristic.*

Size medium; length  $21\frac{1}{2}$ "; wing 16; tail  $9\frac{1}{2}$ ; tarsus over 3". From cere on culmen to tip of bill is more than 0.75". (in the two preceding species it is under 0.75"). Female dark brown throughout except the head and the male is never so pale as the other two and much more variegated.

*Colouration.*

"Adult male. Head, neck and breast buff or pale rufous, with dark brown shaft-stripes, broader on the breast; back and most of the wing-coverts dark brown; scapulars still darker, sometimes grey towards the base; smallest coverts along the forearm whitish, with dark brown shafts; outer greater coverts, primary-coverts, and all quills except first 6 primaries dark silvery grey, remaining coverts and very often the tertiaries dark brown; first six primaries black with the basal portion white; upper



tail-coverts white, with rufous and brown mixed in various ways; tail grey above, isabelline below; abdomen and lower tail-coverts ferruginous brown, more or less striped darker.

*Females* are dark brown except the crown, nape, chin and more or less of the throat, which are buff with brown stripes. There is sometimes a patch of buff on the breast, the wing-coverts and back have buff edges, and the upper tail-coverts are rufous.

The young of both sexes resemble the females except that the buff on the head is sometimes unstreaked and more limited in extent, being confined in some cases to a nuchal patch or even wanting altogether." (Blanford.)

"Bill black; cere and base of bill greenish-yellow; iris yellow, brownish-yellow in females and young; legs and feet rich yellow" (Hume.)

#### *Measurements.*

"Length of males 21; tail 9.5; wing 16; tarsus 3.4. Length of females 22.5; tail 9.75; wing 16.6; tarsus 3.5" (Blanford).

#### *Habits, etc.*

The Marsh-Harrier is a familiar feature of every jheel in the Province and wherever there is a swamp of any kind with reeds, there will be found one or more of this species. Like all other members of this genus this species spends most of its time beating slowly over reeds and grass. The flight is very similar to the others except that the beats of the wing are slower and more deliberate, it is more given to soaring and when so engaged it holds its wings well above the level of the back. Nothing in the way of food comes amiss to this species from a wounded teal to a dead crab or a grasshopper. It is much more given to sitting than any of the others and, in fact, spends a great deal of its time sitting on the bunds of paddy fields or edges of jheels. This species must have a hard struggle for existence and is only saved from starvation by the fact that it is content to eat things which other Raptores do not consider worthwhile to take from it.

Pallas's Fishing-Eagle and the Spotted Eagle are ever on the look out for any tit-bits the Marsh Harrier may find, and unless the latter can hide itself and its quarry in long grass, it stands very little chance of enjoying its breakfast.

There appear to be *many* more specimens in the garb of the female than that of the male, and for every one of the latter one might meet with 10 of the former.

This Harrier, though migratory, breeds frequently in this country and nests have been taken in various places, and the bird is by no means uncommon in the summer. Like all Harriers it builds on the ground and lays 4 or 5 eggs "which are either pure white or slightly spotted and measure about 2" by 1.5" (Blanford.)

## GENUS ASTUR.

No. 1243. *Astur palumbarius*. The Goshawk.*Characteristics.*

Size medium, length of female about 24", male 20"; wing 14" (female), 12" (male). Tip of primaries in closed wing reaching only to about half way down the tail. Bill from gape  $\frac{2}{3}$  to  $\frac{3}{4}$  length of mid-toe, without claw.

*Colouration.*

Variable. In old birds the whole of the upper parts become a sort of ashy grey-brown, the feathers having paler edges "The crown, area behind eye, ear-coverts, and sides of neck darker, sometimes almost black; forehead, lores, long supercilia, and nuchal patch uniting them behind streaked and mixed with white; quills brown above, whitish below, with dark bars; tail light brown or brown mottled with white above, paler below, crossed by four broad dark brown bars and tipped buffy white; lower parts white, with blackish shafts and brown bars, which become narrower and more numerous in older birds; lower tail-coverts white unbarred. Young birds are brown above, most of the feathers edged or tipped with buffy white; crown nape and hind-neck with broad buff or pale rufous edges; quills as in the adult, but with the barring more distinct above; tail with five dark cross-bars and tipped with buff; lower parts buff or pale rufous, with brown longitudinal oval spots, each having a black shaft-line in the middle. Nestlings are covered with pure white down." (Blanford).

"Bill bluish horny; cere yellow with a greenish tinge; iris and legs yellow" (Blanford).

*Measurements.*

Length of female 24; tail 11; wing 14; tarsus 3.3; of a male—Length 20; tail 9.5; wing 12.5; tarsus 3.2 (Blanford).

*Habits, etc.*

The Goshawk is among the best known of the Indian Raptores, not because he is common, but because he is much sought after and far and away the best hawk used in hawking. Every Indian Prince in whose State falconry still survives does not consider his ménage complete without a Goshawk, and it is the zenith of every Indian falconer's ambition to possess one. Most Britishers would probably prefer a falcon, as the spot shown by a hawk is in no way comparable to that of a falcon, but for all that there is no denying the qualities which combine to make the hawk, the Goshawk in particular, the valuable bird it is, Rs. 150 to 200 being paid for a young female a few days after it has been captured.

The Goshawk, during the summer months, is a dweller of the high mountain ranges and to be found in the oak and spruce forests at elevations from 9 to 11,000 ft. Like all true Hawks and Hawk-Eagles, this species does most of its hunting from the boughs of some thickly foliated tree, usually pouncing on its prey before the latter has realised its



danger. I have found this species sitting on a rock on the edge of a plateau, far above the limit of trees, waiting for a covey of snow-patridges to come out and feed among the rocks. They are trapped in large numbers during the late autumn, in long vertical nets stretched along ridges, where small game is plentiful. These nets, or rather a succession of them, cover very often a mile or more of country and vary from 10' to 15' in height.

They are erected much in the same way as a tennis net but the lower end forms a bag into which the victim falls and remains there until the men visit the nest and take it out. Another method adopted to catch this species is by means of three vertical nets each about 7' x 6' x 5'. They are erected to form 3 sides of a square and a pigeon placed in the centre. The man in charge hides opposite the open side of the square, whence he makes the pigeon flutter by pulling a string, when a hawk is seen.

This is a most effective trap for hawks generally, and placed on the top of a knoll, is visible for miles around, and will attract a Goshawk from very long distances.

This species, though it does most of its hunting among trees, may often be seen circling at great heights. In the Himalayas, hawks will generally be found to soar late in the morning or early in the afternoon. Seldom in the middle of the day, early morning or late evening, and if watched it will be seen that a bout of circling on steady pinions is almost invariably followed by a few quick beats of the wing.

The short rounded wings and the long, projecting tail, proclaim the members of this and the next genus from afar, and though I have found falconers who can differentiate, at a glance, between a sparrow hawk and a shikra, I am afraid I have never succeeded in being able to place them *for certain*.

The Goshawk, if disturbed during the day, drops from his perch to within a couple of feet of the ground and flies low and fast until it approaches the tree it intends to alight in and then rises almost vertically into the branches.

This species, together with the Hodgson's Hawk-Eagle does more damage among game birds than perhaps all the other birds of prey combined. Their numbers appear to be on the decrease and I have questioned several men who have the right to erect nets for them, and they all say that they seldom get more than half a dozen in the year where 15 to 20 used to be caught a couple of decades ago.

On one occasion, while in camp in the Simla Hills, I had a most extraordinary experience with one of these birds. It was late in November and we had had an early fall of snow on the hills. My camp was situated in a valley with a fringe of deodars on

three sides and open on the fourth, and I was working in the verandah of the tent which was enclosed by "chicks" all round, except the centre "chick" which was tied up and acted as a doorway. Suddenly there was a tremendous commotion among the fowls and one old cock came rushing into the verandah with something hanging on to him, rushed past my table and into the tent itself. I followed and pulled the squalling bird out from under the bed and to my surprise found a very ancient male goshawk, still holding on. I naturally thought it must be somebody's tame bird escaped.

The hawk literally fell off the cock as soon as I pulled the latter out from under the bed, and lay on the floor in a sort of fit. I picked him up and found it emaciated to a degree and nothing, but skin and bone. There was a slight wound in one wing, which accounted for his condition, and the poor thing evidently put in every ounce of his remaining strength to get a meal, but the cock was one too much for him in his starving condition. The warmth of the stove revived him and he sat on my fist as though he had been accustomed to it for weeks and, had a feed of raw meat, a small one to begin with followed by another in a couple of hours.

In three or four days the bird began to put on condition and in about a fortnight, the wing having entirely healed, I released him after giving him a good meal. This bird was a very pale blue grey above and pure white below profusely barred with black. A dark grey head and orange eyes.

The Goshawk breeds in trees from March to June and lays 3 to 4 eggs, "usually nearly pure white, but occasionally spotted or blotched." I have had youngsters brought to me as late as July and the only nest I have seen was high up in the fork of a Blue Pine (*Pinus excelsa*) at an elevation of about 8,500 feet.

The Goshawk is the only "True" hawk that will follow its quarry for any distance. I have myself seen them follow partridges for 500 yards or so, and Hume quotes Mr. Thompson, a keen falconer, as saying that he has known his Goshawks to take a partridge or quail 800 to 1,000 yards where the hawks were slipped.

No. 1244. *Astur badius*. The Shikra.

*Characteristics.*

Size small, length from  $12\frac{1}{2}$  to 14 inches; wing 7 to  $8\frac{1}{2}$ ; tail 7. Tip of primaries in closed wing only reaching to about half way down the tail; bill from gape  $\frac{2}{3}$  to  $\frac{3}{4}$  length of mid-toe without claw.

*Colouration.*

Somewhat similar to the preceding species, generally and varying from it by the upper parts being brown, in the young, with buff edges to the feathers, to a pale ashy grey in old birds.



The under parts of the young plumage are white with brown centres to the feathers, the upper breast being much more marked than the abdomen, and the marking practically disappearing at the lower tail-coverts.

The breast of an old bird becomes almost rusty red, beautifully pencilled and barred, and the upper surface is almost uniformly ashy grey throughout.

"Bill bluish dusky at the tip; cere bright yellow; irides yellow, becoming deep orange in old birds; legs and feet yellow." (Blanford.)

*Measurements.*

Length of females about 14; tail 7; wing 8.25; tarsus 2; bill from gape 0.8. Males—the length is about 12.5; wing 7. (Blanford.)

*Habits, etc.*

The Shikra is a common feature of almost every grove and garden in the Punjab. It ascends far up into the Himalayas, but I do not think they are even locally migratory, as I have known couples to breed in the plains, year after year in the same spot. It lives on lizards, mice and small birds in its wild state and I have seen this species eating a frog.

This without exception, is the most easily tamed and trained bird of all hawks and falcons and wonderfully hardy. With care and trouble it is possible to hunt this bird within 10 days of its capture, and I have had one coming to the hand on the third day.

The Shikra might often be seen soaring high up in the heavens and has the same habit as the rest of the true hawks of flapping vigorously after accomplishing a few circles on steady wings. The long tail and short rounded wings show him to be a hawk at once, but the Shikra and the Sparrow-Hawk are not easily separated unless they pass very near.

During the breeding season the Shikra is very noisy and its call of two notes, "titu titu" can be heard all over the place and at this season it assumes a most extraordinary flight at times.

The wings, slightly bent, are held far above the level of the back and it progresses in a succession of very slow deliberate beats.

This species must prey a good deal on the Indian Babbler the "Seven Sister" of the European, in this country, as every Shikra is anxious to get at them as soon as he hears them, but easy though they must be to catch, the Shikra has his work cut out to retain its quarry. The moment one is caught, the remainder of the flock rush to the rescue of their "Sister." With feathers fluffed out and wings drooping and tail spread the entire sisterhood come to the attack and the Shikra is struck from every side of the compass at one and the same time. I have had a tame Shikra knocked clean over on to his back and made to release his hold and seek shelter from the infuriated mob. If he can take his prey

away at once and fly across an open bit of country or get into very thick scrub, he is probably left in peace, but otherwise he finds it no easy matter to retain his meal. Though slow in flight, the babler is extremely quick in sharp sudden attacks at close quarters.

The Shikra breeds in trees from April to June building a nest of twigs and sticks lined with grass, roots and laying usually 3, sometimes 4, smooth, bluish-white eggs, usually unspotted, very rarely with a few small greyish specks, and measuring 1.55 by 1.22.

Like the Goshawk, the Shikra is not lacking in pluck and dash and can be trained to quarry bigger and stronger than itself.

Crows and partridges can be taken by a Shikra and Dr. Blanford quotes Jerdon as stating that even young peafowl and small herons do not come amiss, but personally I have never seen one take anything bigger than a crow or a partridge, though I have seen one pull down a wounded Great Stone-Plover which could just fly.

#### Genus ACCIPITER.

No. 1247 *Accipiter nisus*. The Sparrow-Hawk.

##### *Characteristics.*

Size small, length of female about 15"; wing  $9\frac{1}{2}$ "; of male, length about 13; wing 8. Tip of primaries in closed wing reach to about half way down the tail; bill from gape about half mid-toe without claw. There is a vast difference between the tarsi of *Astur* and *Accipiter*, that of latter being very much thinner and the mid-toe longer. "Five or six dark bars, one terminal, on 4th, quill in adults; no gular stripe."

##### *Colouration.*

*Adult male.* "Upper parts slaty grey, some birds darker than others, the white bases of the feathers showing more or less on the nape and supercilia; feathers of scapulars, rump and upper tail-coverts, and sometimes of the back, dark-shafted; quills dark brown above, whitish beneath, with broad blackish cross-bands; tail generally with 4 (sometimes 5) cross-bars on the middle feathers, 5 or 6 on the outer, the last bar broadest and sub-terminal, tips of feathers white; lower parts white or buff, the lower parts more or less distinctly dark-shafted; breast and flanks very often suffused with rusty red, the throat with a few dark shaft-lines; the breast, abdomen and thigh-coverts rather irregularly barred with rufous brown, the bars usually as broad as the interspaces, but in very old birds either rusty red or narrow and dark brown; under tail-coverts white."

*Adult females* are browner above and less rufous beneath, with the dark shafts to the feathers more conspicuous.



Young birds are brown above, the feathers with rufous edges at first, the white very conspicuous on the nape and supercilia; lower parts white, buff, or brownish-buff, feathers of the breast, abdomen, and lower wing-coverts with dark shaft-stripes and spade or heart-shaped rufous-brown spots with dark edges; these spots pass into bars.

"Bill bluish-grey; cere, legs, and toes yellow, claws black; irides yellow in young birds, orange in old." (Blanford.)

*Measurements.*

"Sexes very different in size. Length of female about 15"; tail 7"; wing 9.5; tarsus 2.4; mid-toe without claw 1.6; bill from gape .85; in the male, length about 13; tail 6.5; wing 8; tarsus 2.1." (Blanford.)

*Habits, etc.*

The Sparrow-Hawk, the *Basha* of the Indian falconer, is another favourite and a good many are caught in the nets set for Goshawks, in the Himalayas and brought down for sale. This species is more given to hunting in forests than is the Shikra and may often be seen flying very low to the ground and very fast, in the mornings and evenings. The Himalayan variety (Hume's *melanoschistus*) is a very dark coloured bird, almost black above and deep rusty red beneath. Mr. A. E. Jones, of Simla, has found the species breeding in the vicinity of Mahasu and the Catchment area, (Simla) but how far this "Himalayan variety" extends east or west of Simla I am unable to say.

The flight of the Sparrow-Hawk while hunting is unlike that of a Shikra, but while soaring the two resemble each other very closely.

In the hand, the very thin tarsi and the long thin mid-toe separates this genus from *Astur*, at once.

In the forest, like the Goshawk, this species drops from a branch, flies very low and shoots almost vertically up into the tree it selects to alight in.

The "*Basha*" is a better bird than the Shikra for purposes of sport, being faster and following its quarry for longer distances. Doves appear to be the favourite food of the female Sparrow-Hawk, in its wild state, and bunches of feathers dotted about among the trees where a pair of these hawks have made their home, tell their own tale.

Hawks and falcons, even when soaring or flying from place to place, have their eyes on every point of the compass, and only the other day, I was watching a Sparrow-hawk, which flew close over my head, when it suddenly turned sharp round, increased its pace and dashed into a tree some hundreds yards away in its rear. A crowd of shrieking parroquets dashed out of the branches and I saw the hawk flutter to the ground as though it had got one in its talons. I went up to see and found it was a dove that had been caught and not a parrot. The hawk had been flying in absolutely the opposite direction

when its keen eyes must have seen the dove go into the tree, as it certainly could not have seen it sitting there, among the branches. The tree was a mango and thickly foliated.

The call of the Sparrow-Hawk is very different to that of the Shikra and is composed of two long notes followed by three or four very short ones repeated in quick succession, something like "tiu tiu ti titi".

The "bashin" the male of the sparrow-hawk is very much smaller than the female and I have never seen it used for hawking.

This species builds in the Himalayas from about 5,000 ft. elevation upwards, in trees, and Blanford says it often takes possession of a deserted crow's nest and "lays usually 4 eggs, but sometimes as many as 6 or 7. These are bluish-white, oval, much spotted and blotched with rufous-brown, especially towards the broader end, and measure about 1.7" by 1.3."

No. 1248 *Accipiter virgatus*. The Besra Sparrow-Hawk.

*Characteristic.*

Size small, wing 7 to 8" ; tip of primaries in closed wing reaching only about half way down the tail. Bill from gape about half mid-toe without claw ; a gular stripe usually present ; 7 or 8 bars on 4th quill in adults.

*Colouration.*

Very similar to the preceding species in some of its various phases of plumage, but usually darker resembling more the Himalayan variety of *A. nisus*, except for the gular stripe and the extra bars on the 4th quill.

"Bill leaden grey, blackish at the tip, cere pale lemon-yellow ; irides bright yellow, orange in old birds ; legs and feet yellow." (Blanford)

*Measurements.*

"A Himalayan female measures:—length 14.5 ; tail 7" ; wing 8 ; tarsus 2.5 ; mid-toe 1.5 ; bill from gape 1.7 ; the male is smaller, tail 5 ; wing 6.75." (Blanford)

*Habits, etc.*

Personally I am not at all familiar with this species and have only seen two to my certain knowledge.

One little male was identical with the male of *A. nisus* in the dark Himalayan plumage. It lacked the gular stripe but had 7 distinct bars on the 4th quill. The second was a young bird in the possession of a falconer, said to have been caught in the Kangra hills.

The *Bera* and *Dhooti* as the male and female are respectively called, are frequently taken in the nets erected for Goshawks, in the Kangra District, but as often released. My old falconer was familiar with the species and had a very high opinion of it and considered the female better than the *Basha* (*A. nisus*) being faster and more tenacious but others again and particularly some of those who catch and



sell hawks, in the Kangra District, have told me that there is no demand for them and that when caught in the nets they generally release them though they always keep the *Basha*.

Out of the dozens of the smaller hawks I have caught in various parts of the Himalayas, the little male above referred to is the only one that I have ever succeeded in catching, and yet it does not appear to be very rare and is certainly widely distributed all over the Himalayas, Mr. Hume recording specimens from Gurhwal, Murree and Lahore.

Nothing appears to be known of its breeding in the Punjab though Blanford records nests taken in Sikkhim and Ceylon, both nest and eggs resembling those of the preceding species.

*To be continued.*

## NOTES ON THE NIDIFICATION OF CERTAIN BIRDS IN LADAK.

BY

F. LUDLOW.

The following notes were collected on a shooting trip from Srinagar to the Tso-Morari Lake in Rupshu, and a return journey *via* the Wakka Nallah, Suru, and the Wardwan, during the spring and summer of 1919.

In the majority of instances where clutches were taken the parent bird was shot off the nest and identified as far as possible with Blanford and Oates. Where doubt existed the bird was skinned and forwarded to the Society for identification, whilst Mr. E. C. Stuart Baker very kindly went through the eggs and gave me the benefit of his expert opinion.

The Raven, *Corvus corax tibetanus*.

Fairly common in Central Ladak and Rupshu where it breeds in cliffs in late winter. Fully fledged young seen out of the nest with the parent birds on the shores of the Tso-Morari Lake in early May.

The Jungle Crow, *Corvus coronoides intermedius*.

Nests at Kargil on 18th April 1919 and at Leh on 23rd April 1919, both in poplar trees.

The Jackdaw, *Corvus monedula collaris*.

The only place at which I encountered this species beyond the Western Himalayan barrier, was at Dras on 15th April 1919 where I observed a pair in the neighbourhood of the rest-house.

The Magpie, *Pica pica bactriana*.

Seen directly one crosses the Zoji La., and never lost sight of in the main or side valleys until the treeless Rupshu country is reached. One of the commonest birds in Ladak. I found a single pair at Gya (Alt. 13,500 feet) inhabiting the only tree the place boasts of. Breeds in willows and poplars and occasionally in bushes. Found it building at Kargil on 18th April 1919 and took a clutch of 6 eggs at Mashoo near Leh on 28th April 1919. Eggs measure 35—34×24 mm. Its more Eastern congener, the Black-rumped Magpie of Thibet was not met with.

The Red-billed Chough, *Pyrrhocorax pyrrhocorax*.

Common in Central Ladak and Rupshu where it lays in April and May. One clutch of 3 incubated eggs taken at Meroo midway between Upshi and Gya, at an altitude of about 13,000, on 14th May 1919. Nest in cliff, built of sticks and lined with wool. Eggs are a very pale salmon pink blotched with brown and with secondary purple markings, not unlike those of the common Sandgrouse in colour. They measure 40·5—41×27·5 mm.

Breeds in the town of Leh itself as on 13th June 1919 I saw parent birds feeding their young in the holes of a large kind of 'Hlato' about 500 yards South of the main bazaar.

The Yellow-billed Chough, *Pyrrhocorax graculus*.

Retires during the latter half of May to breed in the most inaccessible cliffs, one spot being the crags overlooking the village of Bhot Karbu, and another, the stupendous perpendicular cliffs of the Wakka Nallah.

The most accessible breeding haunt of this bird which I encountered was in small cliffs on the left bank of the Wakka River, a mile or so beyond the village of Paskyum near Kargil, but even here ropes would be a necessity.



This though appears to be more gregarious than *pyrrhocorax*. I do not remember having seen it in Rupshu, although it possibly occurs there.

Hume's Lesser White-throated Warbler, *Sylvia althæa*.

Took a nest containing two fresh eggs at Shushot near Leh on 10th June 1919. Nest cup-shaped, of dried grass lined with a few hairs, and placed in a low bush two feet from the ground. Eggs greenish-white spotted with yellowish-brown at the broad end, and possessed of a few slatish secondary markings. Eggs measure  $18.75 \times 12.75$  mm. Altitude 10,600 feet.

Tickell's Willow-Warbler, *Phylloscopus affinis*.

Two clutches each containing four eggs taken in the Wakka Nallah on 28th June 1919 and 30th June 1919. Eggs slightly incubated. Nests, elongated ovals composed of dried grass, lined with feathers and with a side entrance, placed in low bushes about two feet from the ground. Eggs white, sparingly spotted with brownish-red. In the second clutch one egg was pure white. Eggs measure  $14.75-16 \times 12$  mm. Altitude about 12,500 feet.

The Brown Willow-Warbler, *Phylloscopus collybita tristis*.

Very common above and below Leh between 10,000 and 12,000 feet. Numerous clutches taken in June and July. Normal number in clutch 4. Nest similar to that of *affinis*. Eggs, white, spotted with rusty-red, measure  $15.5-16 \times 11.5-12$  mm.

The Plain Willow-Warbler, *Phylloscopus neglectus neglectus*.

A single clutch containing four eggs taken at Marshalong near Leh on 6th June 1919. Nest of the usual *Phylloscopus* type. Eggs, white, spotted with rusty-red, measure  $14.5-15 \times 12-12.5$ . Altitude about 11,500 feet.

The Olivaceous Willow-Warbler, *Phylloscopus indicus indicus*. ?

A single clutch of 4 eggs taken on 23rd June 1919 at Bhot Karbu. Nest of the usual *Phylloscopus* type but placed on the ground amidst grass in the bed of a river. Eggs similar to those of *tristis* but measure  $17-16.5 \times 12-11.75$  mm. The correctness of this identification is open to doubt, as I failed to obtain the parent bird after having had two shots at it. From the colouration, size and general behaviour of the bird, I, however, suspected it at the time to be *indicus*, and Mr. Stuart Baker after having examined the eggs is very much inclined to agree with me.

The Large Crowned Willow-Warbler, *Acanthopneuste occipitalis*.

A single clutch of 4 eggs taken in the Wakka Nalla on 28th June 1919. Nest composed of dried leaves and grass lined with thin soft dry strands of grass placed in a low bank beneath the exposed roots of a willow. Eggs, pure white, bluntly pointed at the fine end, measure  $16-15.25 \times 12.50-12.25$  mm. Altitude 12,500 feet.

The Indian Oriole, *Oriolus oriolus kundoo* ?

An oriole straggles as far as Leh during the summer but is far from being common. I never met with its nest or secured a specimen of the bird, and it might possibly turn out to be the European Oriole.

The Siberian Chat, *Ænanthe pleschanka*.

Two clutches taken, each containing four eggs. First nest taken on 25th May 1919 in a hole in a rock on the Ooti Plain near the Tso-Morari lake at an altitude of 15,500 feet. Second nest taken in a 'mani' wall at Thugji on the Tsokr Chumo lake on 2nd June 1919 at an altitude of 14,900 feet.

Nests of dried grass lined with a mixture of wool, hair, and feathers. In both instances the eggs were hard set with embryos about a week old. Eggs, light blue, with small brownish-red spots at the broad end, measure  $21-22 \times 15.5-16$  mm.

The Desert Chat, *Enanthe deserti atrogularis*.

A single clutch taken at Upshi, 40 miles from Leh, on 6th June 1919. Nest constructed in a hole of a stone support to the bridle path, and composed of the same material as in the case of *pleschanka*. Eggs light blue, very similar to the last named species, but the brownish-red spots tend to fuse into a ring at the broad end. Eggs measure 23 by 16 mm. Altitude about 11,800 feet.

The Indian Redstart, *Phenicurus ochrurus rufiventris*.

A very common bird indeed from Suru to Rupshu, breeding from May to July in holes in banks and beneath stones on the steep mountain side. In Ladak it has a special predilection for the 'mani' wall as a nesting site. Nests of dried grass lined with wool, hair and feathers. Numerous clutches taken. Normal number in clutch 4-5. Eggs pure cambridge blue, generally unspotted, but I found one clutch at Gya on 5th June 1919 in which the eggs were very faintly marked with minute reddish-brown spots. Eggs measure 22-19.5 × 14-15 mm.

The Indian Blue-throat, *Cyanosylvia suecica abbotti*.

Two nests found at Bhot Karbu on 24th June 1919. The first contained 4 very much incubated eggs, the second 4 newly hatched young. Nests placed on the ground amongst long grass and low bushes, cup-shaped and built of dried grass. The eggs are described by Blandford as being "blue spotted with reddish brown", but the eggs I have before me are *sage green suffused* with reddish-brown. Distinct spots are not apparent. Eggs measure 19.75-20.25 × 14.75-15 mm. Altitude 11,500 feet.

The White Spotted Blue-throat, *Cyanosylvia suecica pallidogularis*.

Nest containing 4 slightly incubated eggs obtained at Mulbek, a day's march from Bhot Karbu on 25th June. Nest and eggs similar to that of *abbotti* except that the eggs are more olive than sage-green. Eggs measure 19.75-20.25 × 14.75-15 mm. Mr. Stuart Baker remarks 'in epistola' "the breeding of these two birds within the above limits is remarkable and points to the fact that they should be regarded as true species and not races." As Ward records this bird as a rare breeder on the Shyok River in Ladak, it appears that the *trinomials* should be dispensed with.

The Himalayan Ruby-throat, *Calliope pectoralis pectoralis*.

A nest containing 3 fresh eggs was taken at Donore, which lies midway between Suru and the summit of the Bhot Khol Pass on 11th July 1919 at an altitude of about 12,000 feet. The nest was composed of dry grass and placed on the ground underneath a boulder.

Two of these eggs are pale blue very faintly freckled with reddish-brown and are those of *pectoralis*. They measure 22 × 16 mm. The 3rd egg is a specimen of *Cuculuscanorus telephorus* and measures 24.5 × 18 mm. It is pale blue *spotted* with reddish-brown. This cuckoo was not unfrequently seen and heard around Suru and in the Rungdum Valley, but I did not come across it in the Upper Indus Valley around Leh.

The Grey-headed Ouzel, *Merula castanea*.

Nest of 3 fresh eggs taken at Chengher in the Wardwan Valley on 24th July 1919 at an altitude of about 7,000 ft. Nest, composed of twisted twigs and roots intertwined with dead leaves, and lined with green needles of a pine, was placed on the top of a stump of a tree amongst thick jungle about 5 ft. from the ground. Eggs light green covered with brownish-red smudges; 3 measure 29 22.5 mm.

The Robin Accentor, *Laiscopus rubeculoides*.

Nest with 3 eggs taken toward the head of the Umlah Nallah near Leh on 18th June 1919 at an altitude of about 13,000 ft. Nest placed on the



ground and composed of dried grass lined with hair and small particles of moss. Eggs, turquoise blue, measure  $20.5-21 \times 15.5$  mm.

The Rufous-breasted Accentor, *Laiscopus strophiatu*s *jerdoni*.

Nest with 3 eggs taken on 6th July 1919 near Suru at an altitude of about 11,000 feet. Nest and eggs similar to above. Eggs measure  $20.5 \times 14.5-15$  mm.

Adam's Mountain-Finch, *Montifringilla nivalis adamsi*.

Nest taken at Mashoo near Leh on 9th June 1919 containing 4 eggs much incubated. Nest on the ground underneath a large stone, built of dried grass and lined with a profusion of feathers. Eggs pure white and measure  $22-23 \times 16-16.5$ . Altitude 11,500 feet.

A second nest at the foot of the Foti La near Lamayuru in a 'mani' wall contained feathered young on 23rd June 1919. A third nest also with young was found in a cleft in the rocky hillside at the foot of the Namika La on 24th June 1919. This bird is not uncommon in Central Ladak and affects rocky nallah beds, especially those which contain water, at an altitude of 10,000—13,000 feet.

Blandford's description of this bird breeding in *long dykes* in which the Tartars bury their dead probably refers to the 'mani' walls, so common a feature of Ladak scenery; but I do not think they enclose Tartar dead but are erected rather to commemorate some pious Lama.

? House Sparrow, *Passer*?

A species of House Sparrow is common in Central Ladak, and was seen also around the Champa encampments on the shores of the Tsokr Chumo Lake in Rupshu at an altitude of 15,000 feet. I regret I did not secure specimens. *Passer cinnomomeus* does not cross the Western Himalayan Range—at least I did not encounter it, although it is common in the Wardwan.

The Eastern Meadow-Bunting, *Emberiza stracheyi*.

Nest containing two fresh eggs taken in the Rungdum Valley near Suru on 4th July 1919 at an altitude of about 13,000 feet. Eggs measure  $23.25-23 \times 16.50$  mm.

The Crag-Martin, *Ptyonoprogne rupestris*.

Common but nests in most inaccessible places. Took a single egg from a nest in the Wakka Nallah on 27th June 1919, at an altitude of 12,000 feet. Egg white with reddish-brown spots. Measures  $20 \times 14.50$  mm.

Hodgson's Pied Wagtail, *Motacilla alba hodgsoni*.

Common. Nest, at Bhot Karbu on 23rd June 1919, built on the ground underneath a stone in a dry portion of the river bed, containing 3 newly-hatched young and one egg on the point of hatching. At Bazgo near Leh on 19th June 1919, I saw parent birds feeding young out of the nest.

Hodgson's Yellow-headed Wagtail, *Motacilla citreola citreoloides*.

Common in Central Ladak and Suru in swampy localities between 10,000 and 13,000 feet. Nest in the majority of cases on the ground amongst long green grass and small bushes, occasionally in a bank. Nest composed of dried grass lined with hair. Numerous clutches taken. At Shushot near Leh I found this bird building on 11th June 1919. At Mulbek on 24th June 1919 I took a nest of 4 fresh eggs. At the village of Parkutse above Suru on 5th July 1919 I found this bird breeding in abundance near the water channels in the fields. The normal clutch appears to be 4 but two nests were found here each containing one incubated egg, a third nest with one young one, a fourth with one egg and one young one, a fifth with 3 fresh eggs and a sixth with 4 much incubated eggs.

Half way up the Bhot-Khol Pass, at a spot called Donore, on 11th July 1919, I came across four nests of this bird. The first contained fully fledged birds able to fly, the second feathered young still in the nest, the third three fresh eggs whilst the fourth had only just been built and contained nothing.

Blandford states that "the two sexes of this bird are pretty certain to be alike in plumage." This is not the case in the breeding season at any rate. The ♀ differs remarkably from the ♂, in that the whole undersurface and the head are only tinged with yellow, whereas in the ♂ these parts are deep yellow. Eggs measure  $21\cdot50-20\cdot50 \times 16\cdot25-15$  mm.

(Note.—Since writing the above my attention has been drawn to the fact that Whitehead in the Ibis of 1909 has written to a similar effect with regard to the colouration of the sexes, and I have been persuaded to let the above stand for the purpose of independent corroboration.)

The Long-billed Horned Lark, *Otocorys longirostris*.

Nest taken in the Rungdum Valley on 5th July 1919 at an altitude of about 12,000 feet. Two eggs in the clutch, much incubated. Nest on the ground underneath a stone, very small, cup-shaped, lined with hair and dry grass. Eggs, a dirty white mottled with chocolate-brown, measure  $25\cdot55 \times 17\cdot25$  mm.

Elwes's Horned Lark, *Otocorys elwesi*.

Nest with 2 eggs found whilst ascending the Thasang La in Rupshu on 3rd June 1919 at an altitude of 16,000 feet. Nest built on the ground underneath a small "gabshun" bush, composed of dried grass lined with the pappus growth of the "gabshun" seed. Eggs, of the same colour as *longirostris* but are much less attenuated, measuring  $22-22\cdot5 \times 17-17\cdot5$  mm.

Large numbers of these birds were seen feeding in the fields of the Indus Valley above Leh early in May at an altitude of about 11,000 feet. When I returned a month later they had all disappeared.

The Sky-Lark, *Alauda arvensis cinerea*.

Common in the Upper Indus Valley above and below Leh wherever there is cultivation. Clutch at Shushot on 10th June 1919 and another at Nimu on 14th June 1919, both with 3 eggs which measure  $24 \times 16-16\cdot25$  mm.

The Blue Rock-Pigeon, *Columba livia livia*.

This and the next species seem equally abundant both in Central Ladak and Rupshu, breeding for the most part in inaccessible precipices.

The Blue Hill-Pigeon, *Columba rupestris*.

Found an empty nest at Thujgi on 2nd June 1919 in cliffs overlooking the Champa encampment. A frail structure composed of a few twigs placed in a hole of the cliff. Common everywhere above and below Leh and greatly preferable to *livia* for the table.

The White-bellied Pigeon, *Columba leuconota leuconota*.

Fairly common in the Wakka Nallah and around Suru but I do not remember having seen it in the Indus Valley above Leh or in Rupshu.

The Thibetan Sand-Grouse, *Syrhaptes tibetanus*.

I only saw two pairs of this bird during the month I spent in Rupshu.

The Chuckor, *Alecteris graeca pallida*.

Common and breeds everywhere.

The Thibetan Partridge, *Perdix hodgsoniae*.

Common between the Polokonka Pass and the Tso-Morari Lake, especially in the Puga Valley near the sulphur and borax deposits. It frequents trama' bushes in the valley beds and is very loth to take wing. Not



seen below 15,000 feet. By the end of May it had paired off but had not commenced to nest.

The Black-necked Crane, *Grus nigricollis*.

I saw three specimens of this crane on the Tsokr Chumo Lake in Rupshu on 2nd June 1919. I succeeded in shooting one whose head and wing I brought back for identification. The Champas informed me it bred there. Its call note is very similar to that of *communis*.

The Ibis-bill, *Ibidorhynchus struthersi*.

Saw several specimens of this strange bird in and near the islands of the Maroo River just below Inshin in the Wardwan Valley in July 1919. It is a sure find here as I have seen it in this neighbourhood on two previous occasions.

The Eastern Redshank, *Tringa totanus eurhinus*.

Seen in pairs on the Tsokr Chumo Lake, Puga Valley, Tso-Morari Lake and Ooti Plain, but it does not breed in these places until after the month of May.

Came across large numbers of this bird in the Rungdom Valley above Suru on 5th July 1919. Found two empty nests in the midst of small bushes amongst the swamps. From the behaviour of the parent birds, and the piercing cries they uttered, it appeared as though their young had been hatched.

The Himalayan Solitary Snipe, *Gallinago solitaria*.

Shot a specimen in the Puga Valley in Rupshu where it doubtless breeds.

The Fantail Snipe, *Gallinago caelestis*.

Shot a specimen in May 1919 on the Ooti Plain beyond the Tso-Morari Lake in Rupshu. This was the only specimen I saw in Rupshu.

The Brown-headed Gull, *Larus bruneicephalus*.

Abundant on the Tsokr Chumo and Tso-Morari Lakes, but it had not commenced to lay by the end of May.

The Common Tern, *Sterna hirundo tibetanus*.

Pairs seen in the Rungdom Valley on 5th July 1919 but no eggs taken.

The Bar-headed Goose, *Anser indicus*.

Common on the Rupshu Lakes where it breeds in June.

The Brahminy Duck, *Casarca rutila*.

One of the commonest birds in Rupshu breeding in holes in the surrounding mountains, often at a great altitude and at a considerable distance from water. The Ladaki is an omnivorous feeder but this is one of the few animals he will not touch.

The Goosander, *Merganser castor*.

Fairly common along the banks of the Indus above Leh and on the Rupshu Lakes. The crops of a pair of birds I shot were full of a species of eel-worm. Breeds here.

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## SOME NEW INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S.

During the year, 1919, quite a number of new species have been added to the list of Indian *Odonata* and amongst them are two new species of *Gynacantha*. One of these, viz., *G. bainbriggi*, was taken by Mr. Bainbrigge Fletcher at Gauhati, Assam, the other species by myself at Poona, of which the following is the description:—

*Gynacantha millardi*, sp. nov.

Several males and females, Poona, Bombay, Deccan, October-November and February to March.

Male and female alike.

*Head* labrum, face and frons pale green without any markings. (The usual T-shaped mark is absent in this species.) Eyes in juvenile specimens a deep blue, in adults an olive green with a dark brown cap above.

*Prothorax* and *thorax* bright foliage green, the female having a brownish tinting on the dorsum. No markings whatever.

*Abdomen* a pale fawn, the sides of the first three segments green as in the thorax and more so in the male than in the female. Oreillets brown.

*Anal appendages* very narrow and long, especially in the male, fringed internally with longish hairs. Legs brown.

*Wings* long and broad, hyaline, stigma a pale brown. Forewing with 19 annodals, hindwing 14, forewing with 13 postnodals, hindwing 15, hypertrigones with 3 nervures, trigones with 3, the inner with a nervure running from its centre to the proximal side, loop with 10 cells.

Length of hindwing 44 mm., of abdomen 46 mm.

This species is a night-flyer, not appearing on the wing until dusk, after which it can be seen for a long time silhouetted against the sky as it flits swiftly up and down. Its principal food appears to be mosquitoes. There appear to be two broods during the year, the one appearing in October and lasting until the end of November, the other in February when teneral specimens are seen. It is moderately plentiful during the whole of March and disappears abruptly from the beginning of April.

## Tribe AGRIONINI.

*Mortonagrion*, gen. nov.

*Head* not bearing any post-ocular spots but the eyes margined inwardly and narrowly with bright colouring.

*Prothorax* simple, the posterior lobe large and prominent, broadly arched.

*Thorax* with the anterior border laminated and projecting forward to mesh with the posterior lobe of the prothorax.

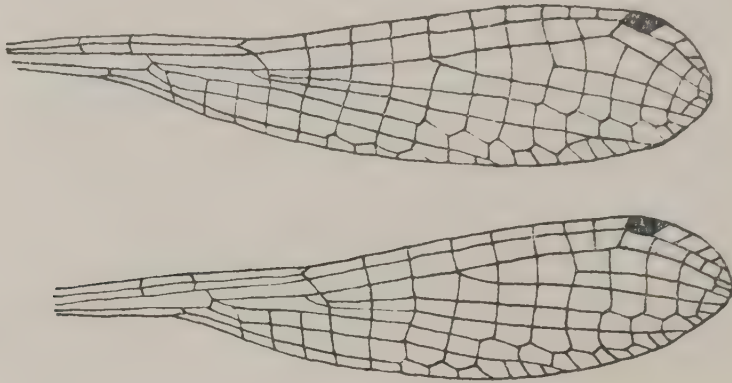
*Abdomen* very slender, very gradually dilating from the 7th to the 10th segment. Anal appendages highly specialised, 10th segment with a bifid tubercle.

*Wings* hyaline, petiolation ceasing proximal to "ac", stigma equal in both wings, rhomboidal but the distal and posterior borders rather longer than the proximal and costal respectively, are distal to the 2nd antenodal nervure, its distance from that nervure being equal to the length of the costal border of the quadrilateral, postnodal nervures 7 to 9. "ac" nearer to the 2nd antenodal nervure in the hindwing, about midway in the forewing,



meeting "ab" well distal to its commencement, "ab" continued outwardly in the same straight line as "Cu2", that is to say, the junction of the two is not angulated. Quadrilaterals differently shaped in the two wings, that of the forewing being more angulated and with the costal border only half the length of the posterior, that of the hindwing with the costal border two-thirds the length of the posterior. Female without a ventral spine to 8th segment.

*Mortonagrion varralli*, sp. nov.



Fore-and hind-wings of *Mortonagrion varralli*.

Several of both sexes from Pawai Lake near Bombay, 14th March 1920.

Male. Length of abdomen 23-25 mm., of hindwing 14-15 mm.

Head, labrum and epistome pale blue, vertex pale reddish brown, occiput a similar colour except for a small, oval spot of pale blue bordering the eye inwardly. Eyes slate blue with a reddish tinge above.

Prothorax reddish brown, pale blue at the sides and narrowly anteriorly.

Thorax pale reddish brown on the dorsum and upper part of sides. A narrow, pale blue humeral stripe. The sides pale blue except for a diffuse pale brown stripe on the 2nd lateral suture. Legs pale brown.

Abdomen similar in colour to the thorax. Fine, apical, dark brown annules to all segments. The ground colour deepens dorsally near the apex of each segment, but there is a clearer annule between this deepening and the brownish black annules. These latter followed by fine, pale blue, basal annules which on the 8th segment lengthens to cover about two-thirds of the segment. The apical border of this conspicuous blue marking deeply notched in the mid-dorsal line. The sides of the 1st and 2nd segment pale blue. Beneath whitish.

The dorsal, apical border of the 10th segment presenting a bifid tubercle very similar to that of *Ischnura senegalensis*. The anal appendages seen from above show the superior divergating, the inferior converging, superior slightly shorter than the inferior, broad at the base, truncated and directed downwards to almost meet the inferior, the latter broad at the base, tapering strongly and curving inwards so that their tips almost meet, curving upwards.

Female exactly similar to the male except for the blue marking on the 8th segment which covers only one-third of it and has a diffuse unnotched border. No spine on the ventrum of the 8th segment.

Hab. In dark, shady jungles, keeping amongst undergrowth. Never comes out in the sunlight. Breeding apparently in wells. Pawai and Vihar Lakes near Bombay.

*Pseudotramea prateri*. sp. nov.

1 ♂ from Turzum Tea Estate, Darjiling, coll. O. Lindgren.

*Head* globular; eyes broadly contiguous, reddish brown above blackish brown at the sides and beneath; suture flush; face broad and flattened yellowish brown, the labrum ochreous and edged with black which has a metallic sheen; vesicle high, flattened at the summit, not notched, ochreous; occiput small, reddish brown.

*Prothorax* small, hidden completely.

*Thorax* bulky, coated with long, coarse hair, reddish brown on the dorsum, golden brown at the sides where the lateral sutures are mapped out obscurely with broken, black lines.

*Legs* black. The hind femora with a row of *ca* 20 short, robust and gradually lengthening spines, tibial spines long and numerous, claw hooks robust, situated near the end of the claws.

*Wings* long and tapering, reticulation close, node slightly proximal to the middle of wing, trigone in the forewing nearly 3 cells distal to the line of the trigone in the hind, trigone in forewing very narrow, its costal side much less than half the length of the proximal, traversed once only; trigone in the hindwing narrow, entire, its proximal side convex outwards and in line with the arc; sectors of arc separate nearly to their origins in the forewing, a long fusion in the hind; arc between the 1st and 2nd antenodal nervures; antenodal nervures  $11\frac{1}{2}$ - $12\frac{1}{2}$ , the final incomplete, the distance between the first two much greater than between the others; only 1 cubital nervure to all wings; no supplementary nervures to the bridge; stigma brownish, that of forewing nearly twice as long as that of the hind; 4 rows of cells in the discoidal field which is of even width throughout; sub-trigone in the forewing nearly square, formed of 6 cells; Rspl. very strongly arched, 3 rows of cells between it and Rs.; Mspl. well developed strongly curved in the forewing, flattened in the hind; the Rs. and M4. nervures strongly curved towards the termen near their ends, in the hindwing, M4. and Mspl. approximate at the angulation; loop very long and narrow, the toe not markedly broadened, divided cells at the trigone and external angle; anal area distinctly divided up into an outer area of more open cells and an inner of closely packed, flattened cells arranged in oblique rows. No basal markings whatever to either wing, the whole wing being hyaline except for a single cell in the anal angle which is brown and chitinous. Length of hindwing 46mm.

*Abdomen* 32 mm., without the anal appendages which are 4 mm. in length. Transverse ridges on the 2nd and 3rd segments, 1st and 2nd segments dilated, especially dorso-ventrally, 3rd and 4th slightly constricted and the remainder tapering to the end, a golden brown in colour, the apices of all segments and the dorsal surfaces of the 8th to 10th segments black. Anal appendages bayonet-shaped, the superior twice as long as the inferior, brown.

Sexual organs of the male, *tramea*-like. Lamina depressed and broad, not fissured; tentaculæ carrot-shaped, long and tapering and ending in a short, downwardly curved spine. The ends divergent, the external tentaculæ obsolete. Lobe long, high and narrow.

This specimen, which is closely allied to *Tramea*, differs from that genus by the greater separation of the sectors of the arc, by the wide space and number of cells between Rs. and Rspl. by having transverse ridges only on the 2nd and 3rd segments and none on the 4th and by the wings being quite immaculate. The latter characteristic is not due to age as the specimen is fully adult. I have named it after Mr. S. H. Prater of the Bombay Natural History Society's staff.



*Protosticta lindgreni*, sp. nov.

1 ♂ from Turzum Tea Estate, Darjiling.

*Head* labrum and anteclypeus pale greenish white, the former bordered with black; remainder of head a shiny black with a bluish metallic reflection; the ocelli bright amber and very conspicuous in their dark setting; eyes pale yellow with a black cap above and a narrow, black, equatorial belt.

*Prothorax* black with a broadish, pale yellow, subdorsal stripe on each side.

*Thorax* black on the dorsum, yellow at the sides. A black line along the lateral suture. Legs yellow, the extensor surfaces black. Wings hyaline, stigma blackish brown, postnodal nervures in forewing 16.

*Abdomen* very long and attenuated, almost as long as in *P. gravelyi* Laid. 1st segment black on the dorsum, the sides and an apical annule yellow, 2nd segment broadly black on the dorsum, the sides yellow, 3rd to 10th segments black at the apices, yellow at the base, these two colours gradually blending into one another.

*Anal appendages*, yellowish, of about equal length, equal to the length of the last two abdominal segments or nearly so. The superior broad at the base and with the outer half bent sharply downwards and shaped like the blade of a kukri; the inferior shaped like the horns of stag-beetle, twisted at the middle and convergent at the apices. A long spiny process springs from just beyond the middle of each process on its inner side and almost meets its fellow across the middle line. At the base of the inferior appendages is a short, stout spine directed backwards and upwards.

This single specimen is named after Mr. O. Lindgren of Darjiling to whom I am indebted for it. It bears a superficial resemblance to *P. himalaica*, Laid. but an examination of the anal appendages serves easily to distinguish them.

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# A TENTATIVE LIST OF THE VERTEBRATES OF THE JALPAIGURI DISTRICT, BENGAL.

BY

CHAS. M. INGLIS, F.Z.S., M.B.O. U., W. L. TRAVERS, H. V.

O'DONEL, M.B.O.U. AND E. O. SHEBBEARE, I.F.S.

## Part III.

(Continued from page 999, Vol. XXVI).

- Barn-Owl (1152), *Strix flammea*.—Uncommon.
- Grass-Owl (1153), *Strix candida*.—Common in grass land.
- Brown Fish-Owl (1164), *Ketupa zeylonensis*.—Common along riverside forest.
- Forest Eagle-Owl (1170), *Huhua nipalensis*.—Found in the forest, but not often seen.
- Scop's Owl (1173), *Scops giu*.—Common and extends well into the plains.
- [Spotted Himalayan Scop's Owl (1175), *Scops spilocephalus*.—Only shot in the Terai.]
- Collared Scop's Owl. (1178), *Scops bakkamæna*.—Very common. This owl has two distinct calls; one the usual call of three or four notes and the other a single note sounding like *wot* repeated at slow intervals.
- Spotted Owlet (1180), *Athene brama*.—Common near habitations, but not in the forest.
- Large Barred Owlet (1183), *Glaucidium cuculoides*.—Noticed in the forest.
- Jungle Owlet (1184), *Glaucidium radiatum*.—Very common.
- Collared Pigmy Owlet (1186), *Glaucidium brodiei*.—Uncommon. It extends well into the plains.
- Brown Hawk-Owl (1187), *Ninox scutulata*.—Very common. It has a fine call note sounding like *pow oof*, *pow-oof*.
- The Osprey (1189), *Pandion haliaëtus*.—A few pairs seen along the principal rivers and occasionally over small pieces of water. The latest date of departure noted by O'Donel was the 9th of June.
- Cinereous Vulture (1190), *Vultur monachus*.—Occasionally descends to the plains.
- Black Vulture (1191), *Otogyys calvus*.—Common.
- Himalayan Griffon (1193), *Gyps himalayensis*.—Common.
- Himalayan Long-billed Vulture (1195), *Gyps tenuirostris*.—Common.
- Indian White-backed Vulture (1196), *Pseudogyps bengalensis*.—Common.
- Booted Eagle (1208), *Hieraëtus pennatus*.—Uncommon.
- Rufous-bellied Hawk-Eagle (1209), *Lophotriorchis kieneri*.—Procured by O'Donel, but very rare.
- Black Eagle (1210), *Ictinaëtus malayensis*.—Uncommon, extending well into the plains during the winter.
- Changeable Hawk-Eagle (1212), *Spizaëtus limnaëtus*.—Fairly common.
- Hodgson's Hawk-Eagle (1213), *Spizaëtus nepalensis*.—Noticed during the cold weather.
- Crested Serpent Eagle (1217), *Spilornis cheela*. Very common.
- Pallas' Fishing-Eagle (1223), *Haliaëtus leucoryphus*.—Common.
- Large Grey-headed Fishing Eagle (1226), *Polioaëtus ichthyaëtus*. Fairly common.
- Hodgson's Fishing-Eagle (1227), *Polioaëtus humilis*. A few pairs extend well into the plains along the rivers.



- Brahminy Kite (1228), *Haliastur indus*.—Rather uncommon.
- Common Pariah Kite (1229), *Milvus govinda*.—Common.
- Large Indian Kite (1230), *Milvus melanotis*.—Common.
- Black-winged Kite (1232), *Elanus caerulus*.—Seen occasionally.
- Pale Harrier (1233), *Circus macrurus*.—A winter visitor to the plains.
- Hen Harrier (1235), *Circus cyaneus*.—Common during the winter.
- Pied Harrier (1236), *Circus melanoleucus*.—Our commonest harrier. Most individuals disappear during the rains, but a few are undoubtedly resident. O'Donel has notes showing birds met with during every month of the year.
- Marsh Harrier (1237), *Circus æuginosus*.—Uncommon.
- Common Buzzard (1241), *Buteo desertorum*.—Obtained during the winter.
- The Shikra (1244), *Astur badius*.—Common.
- Crested Goshawk (1246) *Lophospizias trivirgatus*.—Shot by Inglis in the forest at Kuntimari at the end of January.
- The Sparrow-Hawk (1247), *Accipiter nisus*.—Uncommon.
- Besra Sparrow-Hawk (1248), *Accipiter virgatus*.—Very common.
- Crested Honey-Buzzard (1249), *Pernis cristatus*.—Very common.
- Black-crested Baza (1251), *Baza lophotes*.—Not uncommon in the plains. It is generally found in pairs but occasionally large parties are seen.
- [Blyth's Baza (1252), *Baza jerdoni*.—Only shot in the Terai.]
- Peregrine Falcon (1254), *Falco peregrinus*.—Obtained near the larger rivers during the winter.
- Shahin Falcon (1255), *Falco peregrinator*.—Occasionally seen during the winter.
- Indian Hobby (1261), *Falco severus*.—Uncommon in the plains but possibly resident as O'Donel has seen a bird as late as the 6th August.
- Red-headed Merlin (1264), *Æsalon chicquera*.—Not uncommon in the plains where it breeds during May and June.
- The Kestrel (1265), *Tinnunculus alaudarius*.—Common in the winter in the plains.
- Red-legged Falconet (1267), *Microhierax eulomus*.—Not uncommon in the foothills. It does not extend very far into the plains. We have seen it capture a Ruby-throat.
- Bengal Green Pigeon (1271), *Crocopus phænicopterus phænicopterus*.—Found in the forest but not so common there as it is in the open country.
- Ashy-headed Green Pigeon (1273), *Osmotreron pompadora phayrei*.—Not uncommon.
- Orange-breasted Green Pigeon (1278), *Osmotreron biseincta domvillii*.—Not uncommon in the forest.
- Thick-billed Green Pigeon (1281), *Treron nipalensis*.—Not uncommon in the forest. Green Pigeons are very common round Kuntimari at certain seasons and Shebbeare has shot the above four species there.
- Pin-tailed Green Pigeon (1282), *Sphenocercus apicauda*.—Common in the plains and foothills. It breeds freely in the plains during April and May.
- Wedge-tailed Green Pigeon (1283), *Sphenocercus sphenura*.—Common in the hills, plains and foothills, possibly breeding in the plains as well as the hills. These two species are frequently found in the same flock known as the *Kokla*.
- Green Imperial Pigeon (1284), *Carpophaga ænea ænea*.—Common in the plains and foothills, but not noticed in the hills round Buxa. It breeds in the plains. The Nepalese name is *Hukus*.
- Hodgson's Imperial Pigeon (1286), *Ducula insignis insignis*.—Common in the hills round Buxa and in the foothills. This is also called *Hukus* by the Nepalese.

- Bronze-winged or Emerald Dove (1291), *Chalcophaps indica*.—Very common in the forest, of the plains. The Nepalese name is *Sim-dukur*.
- Indian Blue Rock-Pigeon (1292), *Columba livia intermedia*.—Apparently only found in the cultivated southern part of the district.
- Ashy Wood-Pigeon (1301), *Alsocomus pulchricollis*.—This has been shot by Mr. W. P. Field and by Shebbeare at Gorumara at an elevation of 300 ft. as already recorded in No. 2, Vol. XXV of this Journal.
- Indian Rufous Turtle-Dove (1304), *Streptopelia turtu meena*.—Very common in the paddy lands during the cold weather. It is locally known as the "Bamboo dove".
- Indian Turtle-Dove (1305), *Streptopelia turtur ferrago*.—This has also been got along with the preceding species.
- Spotted Dove (1307), *Streptopelia suratensis suratensis*.—Exceedingly common in the open country.
- Indian Ring-Dove (1310), *Streptopelia risoria risoria*.—Very common in the open country.
- Indian Red Turtle-Dove (1311), *Ænopenopelia tranquebarica tranquebarica*.—Very common in parts of the forest especially at Gorumara and numbers are seen in the cold weather in the paddy lands at Kuntimari. The call note is a peculiar croaky sound.
- Burmese Red Turtle-Dove (1311a), *Ænopenopelia tranquebarica humilis*.—Some birds approach this sub-species more than the last.
- Bar-tailed Cuckoo-Dove (1312), *Macropygia tusalia*.—Common in the hills and extending well into the plains but only found in forest. The Bhutia name for it is *Natti*.
- Common Pea-Fowl (1324), *Pavo cristatus*.—Very local. Common in parts of the district; more so to the east of the Torsa. Where common they breed freely.
- Grey Peacock-Pheasant (1327), *Polyplectron bicalcaratum*.—There are specimens in the British Museum obtained by Mandelli in the Buxa and Bhutan Duars; from the former locality in May and from the latter from February to May. Inglis has received, through the further generosity of Mr. Phillips, a male of this species. It was obtained in March about 4 miles S. E. of Buxa and at a height of 2,000 ft. or thereabouts. Every thanks are due to Mr. Phillips for the great interest and continued help he has given us in obtaining specimens of species, the occurrence of which we were doubtful.
- Burmese Jungle-Fowl (1328), *Gallus bankiva bankiva*.—Common everywhere in the forest and vicinity. Our birds appears to be referable to this species, not having the white ear-lappet.
- Black-backed Kalij Pheasant (1338), *Gennæus melanonotus*.—Very local but scattered in various places all over the northern part of the district in hills and plains alike. It is seen as low as 329 feet above sea level and as far as 16 miles from the foothills. It usually haunts damp evergreen jhoras and without dogs is not often seen and when treed by them is rather difficult to spot. Both O'Donel and Inglis have seen a Kalij with white bars on the rump on separate occasions, in the neighbourhood of Sivoke, and Shebbeare got a similar bird in the adjoining district of Goalpara which Mr. Stuart Baker considers a hybrid between *Gennæus horsfieldi horsfieldi* and *Gennæus melanonotus*. No pheasants with white bars on the rump have been seen by us in this district which lies between the above localities.
- The Monal (1342), *Lophophorus refulgens*.—Sunder gives this as "found between Buxa and Sinchula, but rare." We have so far not been able to get it.
- Blue-breasted Quail (1354), *Excalfactoria chinensis*.



Common or Grey Quail (1355), *Coturnix communis*.

Black-breasted or Rain Quail (1356), *Coturnix coromandelica*.

Inglis' Bush-Quail (1361a), *Microperdix inglisi*.—The type specimens were procured in Goalpara; there is an account of this bird in No. 1, Vol. XIX of this Journal. Primrose has seen the bird in this district not far from the Torsa, and Shebbeare also believes he has seen it. There is a ragged skin in the British Museum said to have been got in the Bhutan Duars. This is evidently the bird mentioned by Lt.-Col. Thornhill as shot by him at Alipur-Duar, *vide* J. B. N. H. S., Vol. XV, p. 527.

Blyth's Hill-Partridge (1363), *Arboricola rufigularis*.—Common in the undergrowth round Buxa, and the only Hill Partridge obtained by us.

Red-breasted Hill-Partridge (1366), *Arboricola mandellii*.—Specimens have been obtained in the Bhutan Duars in April, probably in this district, though we have been unable to get it.

Black Partridge (1372), *Francolinus vulgaris*.—This, like other Game Birds, is fast on the decrease. The Sonthal coolie, introduced in large numbers from Chaibassa of late years, loves shikar and, according to Travers, many and many a partridge is run down by these people.

Grey Partridge (1375), *Francolinus pondicerianus*.—Sunder says it is found in similar localities as those in which the Black Buck is got.

Kyah or Swamp Partridge (1376), *Francolinus gularis*.—Getting scarce as suitable localities decrease.

Burmese Bustard-Quail (1382), *Turnix pugnax plumbipes*.—Resident and breeding in the tea during June and July. This bird has an exceptionally loud note in the breeding season *oof, oof, oof*, strongly boomed.

[Little Button-Quail (1383), *Turnix dussumieri*.—Almost certain to occur.]

Indian Button-Quail (1384), *Turnix tanki tanki*.—Recorded from Bhutan Duars. A specimen in the British museum being got there in April.

Blue-breasted Banded-Rail (1389), *Hypotaenidia striata*.

Banded Crake (1395), *Rallina superciliaris*.—For the past four years the call of a bird had been puzzling O'Donel during April and May and it was only this year that he was able to shoot it and found it to be this species. He found them inhabiting fairly thick jungle, the favourite place being light tree forest with scrub over which creepers hang. Judging from the number of birds heard calling they must exist in fair numbers. The note "*Kok*" said through one's nose is the exact sound and is uttered during the late afternoon and at night and appears to be the breeding call as bird answers bird, and O'Donel firmly believes that it breeds here. It is easy to get close to the bird, but quite a different thing to see it as the grass is up in the scrub jungle at this time of the year. The above remarks were all given by O'Donel.

[Brown Crake (1400), *Amaurornis akool*.—Only shot in Goalpara, but probably got in the south of the district].

White-breasted Water-Hen (1401), *Amaurornis phoenicurus*.—Common.

[The Moorhen (1402), *Gallinula chloropus*.—Only shot in Goalpara, but certain to be found in the south of the district.]

[Water Cock (1403), *Gallicrex cinerea*.—Only shot in Goalpara, but probably got in the jheels.]

Purple Moorhen (1404), *Porphyrio poliocephalus*.—Got in the jheels.

[Great Indian Bustard (1414), *Eupodotis edwardsi*.—Sunder gives this as common in the grass jungle of high lands in the cold weather. This is most improbable as they have never been found nearly as far east as this district.]

Lesser Florican or Likh (1416), *Sypheotis aurita*.—Decidedly uncommon. Two were shot at Neora Nuddy tea garden and reported to Travers. This garden is not very far from Baradighi. O'Donel has recorded them from Hasimara in Vol. XXII, No. 1, page 201 of this Journal. He has only seen them in April, May and June.

Bengal Florican (1417), *Sypheotis bengalensis*.—This fine bird is steadily decreasing owing to the indiscriminate shooting of hens and the increasing acreage under tea. It breeds in March and April, the eggs according to O'Donel, being often laid in tea and consequently destroyed during cultivation. One was shot near Ramshai during the X'mas week of 1918.

Stone-Curlew (1418), *Ædicnemus scolopax*.—Common.

Great Stone-Plover (1419), *Esacus recurvirostris*.—Found on the larger rivers and breeds on the Sankos.

Small Indian Pratincole (1427), *Glareola lactea*.—Common and breeds on the Sankos.

Bronze-winged Jacana (1428), *Metopodius indicus*.—Common in centre and south of the district.

Pheasant-tailed Jacana (1429), *Hydrophasianus chirurgus*.—Found in south of the district.

Red-wattled Lapwing (1431), *Sarcogrammus indicus*.—Very common.

Indian Spur-winged Plover (1435), *Hoplopterus ventralis*.—Very common.

Eastern Golden Plover (1439), *Charadrius fulvus*.—Seen in open country.

Grey Plover (1441), *Squatarola helvetica*.—Seen at Nilpara.

Kentish Plover (1446), *Ægialitis alexandrina*.

Little Ringed Plover (1447), *Ægialitis dubia*.

Long-billed Ringed Plover (1449), *Ægialitis placida*.

The Ibis-bill (1453), *Ibidorhynchus struthersi*. O'Donel has shot them on the Tista and Torsa rivers. He never saw them beyond two miles from the hills.

Common Sandpiper (1460), *Totanus hypoleucus*.

Wood Sandpiper (1461), *Totanus glareola*.

Green Sandpiper (1462), *Totanus ochropus*.

The Greenshank (1466), *Totanus glottis*.

Little Stint (1471), *Tringa minuta*.

Temminck's Stint (1474), *Tringa temmincki*.

The Woodcock (1482), *Sclopax rusticola*.—Woodcock are rarer in the Duars than one would expect and although the district is not far from their haunts in the hills, they seldom visit us in the cold weather. Travers has seen one and one was shot by Mr. Whitmore in the Nagrakata district. Mr. R. S. Hutchinson, D.I.G. Police, Jalpaiguri records ten birds put up twice in tiger beats at Gorumara on 11th and 12th April 1920. This is exceedingly late for them to be in the plains; they should be pretty high up in the hills by then.

Wood-Snipe (1483), *Gallinago nemoricola*.—According to sportsmen who have been in the district many years, this bird was commoner before so much jungle was cleared for tea. O'Donel says it is apparently a very irregular winter visitor. He put up three while out shooting along a forest stream in November 1915 but although he has searched the same stream since then he has never seen any more. Travers has shot one and according to him it is very rare. Stuart Baker mentions it as met with in Buxa and Jalpaiguri and that he got a bird shot in the swamps at the foot of the hills in May but we have found no other records except those mentioned above.

Common Snipe (1484), *Gallinago caelestis*.



Pintail Snipe (1485), *Gallinago stenura*.

Travers writes that this district is not one where large bags of snipe are made; in the adjoining districts of Dinajpur and Rangpur they are far more numerous. Snipe arrive early in August and some remain as late as May. The 19th of August (Stuart Baker gives the 12th August) and the 5th of May are the earliest and latest dates on which he has actually shot specimens, pintail, in both cases; but he has seen birds a fortnight earlier and later. They have been reported to him in every month of the year and it is probable that a few do summer here and breed in the lower hills in Bhutan and within our limits. In Vol. XXIV, No. 2, page 367 of this Journal, Mr. Hodding wrote that he had caught, on the 12th August 1915, one out of three young Fantail Snipe which were with one of their parents on a nearly submerged piece of grassland on the Tista in the Rangpur district. Travers states that snipe are more numerous in October and November and again in February and March, though in a few favourite places a few remain throughout the cold weather. Pintail remain longer than the fantail and the former are often found in scrub and thatching grass near a feeding ground that has dried to hardness.

Himalayan Solitary Snipe (1486), *Gallinago solitaria*.—With the exception of O'Donel's remarks, those on the Woodsnipe are the same for this species.

Jack Snipe (1487), *Gallinago gallinula* — Uncommon.

Painted Snipe (1488), *Rostratula capensis*.

Indian River Tern (1503), *Sterna szena*.—Found on large rivers.

Black-bellied Tern (1504), *Sterna melanogaster*.—Found on large rivers.

White-shafted Ternlet (1509), *Sterna sinensis*.—Shot on the Sankos.

Indian Little Tern (1510), *Sterna minuta gouldiae*. Seen on the Sankos.

Indian Skimmer or Scissors-bill (1517), *Rhynchops albicollis*.—Often seen on the Sankos.

Eastern White Pelican (1520), *Pelecanus roseus*.

White or Roseate Pelican (1521), *Pelecanus onocrotalus*.—

We have once or twice seen flocks of one or other of these pelicans during the cold weather.

Large Cormorant (1526), *Phalacrocorax carbo*.—More common along forest streams, but occasionally seen on the upper reaches of the Torsa river.

[Indian Shag (1527), *Phalacrocorax fuscicollis*.—Only seen in Goalpara.]

Little Cormorant (1528), *Phalacrocorax javanicus*.—Very common everywhere in the plains.

Indian Darter or Snake-Bird (1529), *Plotus melanogaster*.

Black-Stork (1547), *Ciconia nigra*. Observed near Nilpara. A few pairs seen on the larger rivers in winter.

White-necked Stork (1548), *Dissura episcopus*.—A specimen in the British Museum from the Bhutan Duars was got in February.

Black-necked Stork (1549), *Xenorhynchus asiaticus*.—Common in the beds of the rivers and apparently resident.

The Adjutant (1550), *Leptoptilus dubius*.

Lesser Adjutant (1551), *Leptoptilus javanicus*.

Eastern Purple Heron (1554), *Ardea manillensis*.

Great White-bellied Heron (1557), *Ardea insignis*.—Uncommon and keeping to the larger rivers and those running through forest. O'Donel remarks that it disappears from the plains during the rains and that it generally feeds at dusk, but also occasionally does so at mid-day.

Large Egret (1559), *Herodias alba*.—Not uncommon.

- Smaller Egret (1560), *Herodias intermedia*.—A specimen in the British Museum was got in January.
- Cattle Egret (1562), *Bubulcus coromandus*.—Very common.
- Pond Heron (1565), *Ardeola grayi*.—Very common.
- Little Green Heron (1567), *Butorides javanica*—Very common.
- Night Heron (1568), *Nycticorax griseus*.
- Chestnut Bittern (1572), *Ardetta cinnamomea*.—Common.
- [Black Bittern (1573), *Dupetor flavicollis*.—Shot in Goalpara and believed to be found in this district.]
- The Bittern (1574), *Botaurus stellaris*.—Sunder gives it as found on banks and churs of large rivers and jheels. We have never seen it in this district.
- Grey Lag Goose (1579), *Anser ferus*.—
- Red-billed Goose (1579a), *Anser rubri-rostris*.—
- } Rare, one of these geese is found.
- Barred-headed Goose (1583), *Anser indicus*.—Rare. Geese are occasionally seen on the Tista and we believe they have also been seen away from the river.
- Comb Duck (1584), *Sarcidiornis melanonotus*.—One specimen in the British Museum from the Sikkim Terai.
- [White-winged Wood-Duck (1585), *Asarcornis scutulatus*.—Inglis' collector saw a duck on the Neora river. He said it was about the size of a Comb-duck but brown below. It could not have been a Comb-duck as the man knows that bird well and the only bird Inglis thinks it could have been is this species.]
- Ruddy Sheldrake or Brahminy Duck (1588), *Casarca rutila*.—Common on larger rivers.
- Whistling Teal (1589), *Dendrocygna javanica*.—Resident and very common, breeding freely in the district.
- Large Whistling Teal (1590), *Dendrocygna fulva*.—Rare. Travers records one shot at Borara and a pair were also seen there which flew off in company with a large flock of the common whistling teal.
- Cotton Teal (1591), *Nettopus coromandelianus*.—Resident and very common. It breeds in the district.
- The Mallard (1592), *Anas boscas*.—Large bags of ducks are not made in this district. Travers says they are got in large numbers in the adjoining district of Dinajpur and Rangpur and also that many species of duck remain upon little ponds and lakes in October and early November and then depart for the south. A few Mallards are seen in October and are rarer after November, and after December they probably proceed south.
- Falcated Teal (1594), *Eunetta falcata*.—Travers records a bird shot at Borara and a couple were shot a few miles to the south of the district. These birds are probably commoner than they are supposed to be as unless drakes are shot one seldom hears of them.
- The Gadwall (1595), *Chaulelasmus streperus*.—Some years these duck are far more plentiful than others and a fair proportion are sometimes obtained.
- Common Teal (1597), *Nettium crecca*.—This is the commonest of the true teal and large flocks are seen during migration in April.
- The Wigeon (1599), *Mareca penelope*.—Not common. Single birds are often seen.
- The Pintail (1600), *Dafila acuta*.—Large flocks are found in March upon the larger rivers.
- Garganey or Blue-Winged Teal (1601), *Querquedula circia*.—Not as common as the common teal, but large flocks are seen at migration time.



The Shoveller (1602), *Spatula clypeata*.—Not uncommon.

Red-crested Pochard (1604), *Netta rufina*.—Not frequently shot.

The Pochard (1605), *Nyroca ferina*.—Not rare.

White-eyed Duck (1606), *Nyroca ferruginea*.—The commonest non-resident duck. It comes early and stays late and in this district is a fair table bird.

Tufted Duck (1609), *Nyroca fuligula*.—Shot in fair numbers.

The Goosander (1613), *Merganser castor*.—Very common on the larger rivers, but not generally seen more than 13 miles from the hills, though on the Sankos they occur a good deal further off. O'Donel has seen full plumage drakes in December. They take a heavy toll of the fish in the rivers and Travers has seen them in a line across the shallows of a stream and their crops are always, in those shot, crammed full of fish.

Indian Little Grebe (1617), *Podiceps albipennis*.—Occurs in the south.

#### CROCODILES.

The Gharial (1), *Gavialis gangeticus*.—Mostly found in the south, where it attains a very large size in the Sankos.

#### TORTOISES.

[*Trionyx gangeticus* (5), According to Dr. Annandale this tortoise is likely to occur but we have not observed it.]

[*Trionyx leithii* (6), The same remark applies to this species.]

*Trionyx hurum* (7).

*Chitra indica* (12).

*Emyda granosa* (13).

*Testudo elongata* (16).

*Geomyda indopeninsularis*.

*Geomyda tricarinata* (25).

[*Cyclemys dhor* (27), According to Dr. Annandale this is also likely to occur.

*Kachuga tectum* (42).

#### LIZARDS.

*Hemidactylus gleadowii* (86), Known as the "tikiki."

*Gecko verticillatus* (103), Known as the "tuktu" or gecko.

Common Bloodsucker. (145) *Calotes versicolor*.—Known as the "bloodsucker."

*Veranus spp.*?—At least one monitor lizard (goi-sanp), erroneously called iguana, occurs, probably more than one.

*Mabuia carinata* (211).

#### SNAKES.

*Typhlops jerdoni* (27), There is a specimen in the Indian Museum from Buxa Duars.

Burmese Blind Snake (276), *Typhlops diardi*.—One obtained by Capt. K. L. W. Mackenzie at Buxa, and Col. Wall recorded another which Mr. Jacob obtained in the Jalpaiguri district.

Common Python (286), *Python molurus*.—Common in certain localities. It grows to a large size, an 18 feet specimen was recorded by Major Begbie as got in Tondou forest which had swallowed a leopard. One was captured some years ago at Baradighi with a recently swallowed barking deer inside it.

Shaw's Wolf Snake (348), *Lycodon jara*.

Common Wolf Snake, (351), *Lycodon aulicus*.—Very common in bungalows.

Collared Dwarf Snake (363), *Polyodontophis collaris*.—A single example was obtained by Capt. K. L. W. Mackenzie at Buxa and three from other parts of the District by Mr. Jacob.

- Striped Kukri Snake (376), *Simotes cyclurus*.—Very common, brick red and brown coloured varieties are obtained.
- White-banded Kukri Snake (377), *Simotes albocinctus*.—Capt. Mackenzie obtained four examples at Buxa.
- Indian Rat Snake (397), *Zamenis mucosus*.—Common.
- Trinket Snake (406), *Coluber helena*.
- Striped-necked Snake (410), *Coluber radiatus*.—Two were obtained by Captain Mackenzie at Buxa.
- Ring-tailed Dhaman, *Coluber cantoris*.—A single example was obtained by Mr. Jacob.
- Golden Tree Snake (463), *Chrysopelea ornata*.—Mr. Jacob obtained a single example and Capt. Mackenzie got one at Buxa. Travers got one in a coolies' house.
- Eastern Bronzeback (417) *Dendrophis pictus*.
- Dibrugarh Bronzeback, *Dendrophis proarchos*.
- Indian Bronzed-backed Tree Snake, *Dendrelaphis tristis*.
- Malayan Bush Snake (431), *Tropidonotus subminiatus*.—Obtained by Capt. K. L. W. Mackenzie at Buxa.
- Himalayan Bush Snake (432), *Tropidonotus himalayanus*.—Recorded from Buxa.
- Hooded Tree Snake (422), *Pseudoxenodon macrops*.
- Buff-striped Keelback (434), *Tropidonotus stolatus*.
- Chequered Keelback (435), *Tropidonotus piscator*.
- Arrow-backed Cat Snake (447), *Dipsadomorphus gokool*.
- Grey Cat Snake, (449), *Dipsadomorphus hexagonatus*.—Recorded from Buxa and also got by Travers.
- Black-barred Cat Snake, *Dipsadomorphus cynodon*.
- Indian Egg Eating Snake, ( 452), *Elachistodon westermanni*.—Two specimens of this very rare snake were obtained by Travers.
- Mock Himalayan Viper, (453), *Psammodynastes pulverulentus*.—Two examples were obtained by Capt. Mackenzie at Buxa. Travers got at Baradighi.
- Malayan Whip Snake (460), *Dryophis prasinus*.
- Common Green Whip Snake (461), *Dryophis mycterizans*.
- Schneider's Water Snake (467), *Hypsirrhina enhydria*.—Recorded from Jalpaiguri by Wall.
- Banded Krait (484), *Bungarus fasciatus*.—Mr. Jacob shot a specimen attacking a *Dipsadomorphus cynodon*. Travers has got several specimens.
- Common Krait (482), *Bungarus candidus*.—Rare in the Duars.
- Lesser Black Krait, *Bungarus lividus*. } A record specimen of *lividus* 41"
- Black Krait, *Bungarus niger*. } long was captured at Baradighi.
- These Black Kraits are found in fair numbers, but no case has been known of any coolie having been bitten by either of them.
- The Cobra (485), *Naia tripudians*.—Duars Cobras are generally monocellate, though spectacled specimens are occasionally met with.
- King Cobra (486), *Naia bungarus*.—Rare. An 8'-8½" specimen pursued some coolies for a short distance at Baradighi. When killed a large monitor lizard was found inside.
- Russell's Viper (520), *Vipera russelli*.
- Comon Green Pit Viper (581), *Lachesis gramineus*.

#### BATRACHIANS.

- Indian Bull Frog (16), *Rana tigrina*.
- Common Indian Toad (115), *Bufo melanostictus*.—This toad frequently enters bungalows.



## FISH.

- (Singi, Beng.) (133), *Saccobranchus fossilis*.  
 (Bowali, Beng.) (134), *Wallago attu*.  
 (Bachwan, Hind.) (135), *Eutropiichthys vacha*.  
 (Tengra, Beng.) (172), *Macrones bleekeri*.  
 (Bagara, Beng.; Gunch, Hind.) (207), *Bagarius yarrelli*.  
 [*Gagata batasio* (224).—Recorded from the Tista river, not observed by us.]  
 [*Nemachilus corica* (253).—Recorded from N. E. Bengal, not observed by us.]  
 [*Psilorhynchus balitora* (278).—Recorded from hill streams and rapids in N. E. Bengal, not observed by us.]  
 [*Oreinus richardsonii* (283).—Recorded from Sub-Himalayan range and Bhutan, not observed by us.]  
 (Rohu, Hind.) (297), *Labeo rohita*.  
 (Denkara, Beng.; Goti, Oep.) *Labio pangusia*.  
 (Tehr., Nep.) *Labeo* sp.—A hill stream species, so far not identified.  
*Cirrhina reba* (323).  
 (Darangni, Mech.) (326), *Semiplotus maccllellandi*.  
 (Dowka, Mech.) (339), *Barbus chagunio*.  
*Barbus sarana* (341).  
*Barbus dukai* (352).—Recorded from the Tista, not observed by us.  
 (Sor-masa, Nep.; Jungi-Mas., Beng.) (353), *Barbus tor*.—There appears to be three varieties of Mahseer in this district, two of which are distinguished by colour alone, the first being lighter, silver and gold, the second darker, slate and copper approaching the colour of *B. hexastichus*, and the third known by its elegant shape and neat mouth. The first type is everywhere the commonest, though in the Sankos, the second is fairly common; the third type is least common; it has been caught in the Jaldhaka and, I think, in the Torsa and Sankos.  
 (Katli, Nep.; Buluk, Beng.) (354), *Barbus hexastichus*.—The fish which we get here does not quite tally with the description in the Fauna, the fins being slaty-blue and with no reddish tinge in the caudal and anal. In a freshly caught fish the scales above the lateral row are almost exactly the colour of a freshly minted penny and their bases are bronze-green; those below the lateral row are white with a faint blue-green wash. The upper part of the head is dark olive, almost black, fading to white on the underside.  
*Barbus chola* (374).  
*Barbus conchoni* (389).  
 (Dankoni, Beng.) (411), *Rasbora daniconius*.  
*Rasbora buechanani* (412).  
 (Katal-Kusi, Nep., Kursha, Beng.) (413), *Aspidoparia morar*.  
*Barilius bendelisis* (426).  
 (Na-musha, Mech.) (431), *Barilius birna*.  
*Barilius bola* (435).—Sometimes known as the "hill trout."  
 [*Danio aequipinnatus*. (439).—Observed in the adjoining Terai by Inglis.]  
 [*Danio dangila* (440).—Observed by Inglis in the adjoining Terai.]  
 [*Danio rerio* (443).—Observed by Inglis in the adjoining Terai.]  
 (Moh., Hind., (519).—*Notopterus kapiat*.  
 (Kowa, Hind. (536).—*Belone cancila*.  
*Ambassis nama* (628) }  
*Ambassis ranga* (629) } One or more of these species occur.  
*Ambassis baculis* (630) }  
 (Tota, Beng.) (827), *Nandus marmoratus*.  
 (Turi, Beng.) (1159), *Mastacembelus armatus*.  
 (Sal-Mas., Beng.) (1203), *Ophiocephalus striatus*.—Known as murrel.

[*Ophiocephalus punctatus* (1206).—We think this species is found.]

*Anabas scandens* (1208).—Known as the climbing perch.

[*Osphromenus nobilis* (1211).—Recorded from N. E. Bengal, not observed by us.]

*Tetrodon cutcutia* (1406).

We append a list of native names of fish given by Sunder in his Settlement Report with the hopes that some member may be able to let us know to what fish they refer. We mention what we think some of them may be:—

Chital. (Probably 520), *Notopterus chitala*.

Chandan Koorsha. } (Possibly 295), *Labeo gonius* and (305), *Labeo angra*  
Pani Koorsha

Baos or Kalbaos (293), *Labeo calbasu*.

Soul. (1198), *Ophiocephalus marulius*.

Airh.

Bag Airh.

Magur. (121), *Clarias magur*.

Moja Tengra. }

Lallua Tengra. } *Macrones* sp.

Kooji Tengra. }

Taki, Sati of Toopkooni.

Khoilsha.

Ilis or Ilsa. (Probably 470), *Clupea ilisha*. This is only found here in bazars.

Elanga. *Danio* sp.?

Kuchia. (70), *Amphipnous cuchia*.

Phul bacha. }

Naria bacha. } One of these is probably (135), *Eutropiichthys vacha*.

Foli.

Pabda. (138), *Callichrous bimaculatus* or (14), *Callichrous pabda*.

Khata, viz., Buna Khata and Deo Khatta.

Katna.

Khotti. (Perhaps (417), *Rohtee cotio*.

Bhot Khotti.

Borelli.

Dudua Cheng. }

Hooloo Cheng. } Possibly *Ophiocephalus* sp.

Boora Cheng. }

Barra Isla. }

Satasi Isla. } Asla is the Nepalese for (283), *Oreinus richardsonii*.

Bhath Isla. }

Kala Isla. }

Baim. (Perhaps 1159), *Mastacembelus armatus*.

Koochia. (70), *Amphipnous cuchia*.

Tara Koochia.

Choota Gochi.

Falua Gochi.

Tooree Gochi. Turi is the Bengal for (1159) *Mastacembelus armatus*.

Balia.

Batasi. (150), *Pseudeutropius atherinoides*.

Darika.

Bhol.

Tepa. *Tetrodon* sp.

Pangas.

Chella. (Perhaps 449), *Chela gora*.

Puti. Various small species of *Barbus*.



Baspata. (143), *Ailia coila*.  
Khorsola. (161), *Macrones corsula*.  
Ahela.  
Cheku.  
Baghi. (Probably 230), *Botia dario*.  
Poya.  
Ghoor poya.  
Jhuri poya.  
Moogroosh.  
Ghora. (449), *Chela gora* ?  
Pogol.  
Dhakra.  
Badangi or Chapti.  
Lengsa.  
Tita.  
Khoota.

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## MISCELLANEOUS NOTES.

## No. I.—TIGER AND GOAT.

In the Deccan, at any rate, it is uncommon, I believe, for a tiger to be attracted by a goat, so the following incident is perhaps worth mentioning.

One January evening my daughter and I went out to sit up for a panther a mile or so from our camp in the Hyderabad Districts. The machan was placed on a thickish tree in a glade amid fairly heavy jungle. After we were seated, a flock of goats was driven in due course along the foot of the hill, where the panther was supposed to live, and came up behind our tree, bleating lustily. A kid was quickly seized and tied up to a stump in the glade, and the rest of the flock passed on feeding leisurely back in the direction of the village, while the men in charge kept calling as they went, in accordance with the usual procedure to give the panther the idea that the goat left behind was a casual straggler.

The flock had not gone much more than 100 yards when my daughter, her attention attracted by a slight rustling to the rear, nudged me and whispered "Big Tiger!" Glancing back over my shoulder, there sure enough, I saw, not the spots of the panther we were expecting, but the stripes of a full-grown tiger, which was striding stealthily along—ears cocked, and a beautiful picture of alert concentration—in the direction of our machan. Passing out of sight beneath us for an instant, the tiger then ran rapidly on to the kill. My daughter in her anxiety to save the goat fired at the tiger tail-on, rather too soon to get a picked shot, and the beast bounding off into the long grass it became a case of driving in a herd of buffaloes the next day, but that is another story.

The goat, it may be mentioned, was saved by the skin of its teeth, receiving only one claw mark, as the tiger reached out to seize it.

When the incident was discussed afterwards, one well-known old shikari of the neighbourhood was inclined to scout the idea that any tiger would follow up a flock of goats in this fashion. The shikari of the village, however, expressed no surprise and said he knew the tiger in question well as a brute which would go for anything from frogs in the tank to dogs, goats, or even a man.

THE RESIDENCY, HYDERABAD, DECCAN,

S. M. FRASER.

*January 1920.*

## No. II.—LENGTH OF TIGERS AND PANTHERS.

In No. 3, Volume XXVI of the Journal, H. H. The Maharaja of Dhar gives some notes on the length of tigers and panthers, shot in his State. It would be interesting to know how the measurements were taken. Such measurements cannot be considered satisfactory unless taken in a straight line between pegs, the tail being measured separately. Measurements round curves must always be unreliable, as no two people are likely to make them alike. His Highness specifies a tigress 9 feet 10 inches in length. I find my longest tiger recorded as 9 feet 8 inches in length, and tigress 8 feet 6 inches. Out of a long series carefully measured only two of each sex reached even those lengths. Tails are generally three feet, an inch or two more or less. Measurements were taken in a straight line between pegs driven into the ground at the nose and root of the tail. Measurements of skulls in a straight line between uprights from end to end and across the zygomatic arches should also be taken.

In Volume XX of the Journal the length of a panther shot by a villager in Tehri State is given as 9 feet 3 inches, but it is not stated how it was measured.

BAFFORD GRANGE, CHELTENHAM,

R. G. BURTON, BRIG.-GENL.

*December 1919.*



## No. III.—TIGERS IN TREES.

With regard to Mr. Monteath's note on this subject in Journal No. 3, Volume XXVI, some interesting instances of tigers climbing trees are given in the *Bengal Quarterly Sporting Review* for 1843. Two similar instances are also recorded by "Teutoni" in the *India Sporting Review* of 1856. But the most remarkable instance is related in graphic detail in the *South of India Observer* in 1870, when Colonel Christie and Mr. Hadow shot a tigress out of a tree that was perpendicular for 25 feet from the ground and about a foot in diameter. The tigress climbed the tree twice during the hunt, which took place near Ootacamund.

R. G. BURTON, COL.

*December 1919.*

## No. IV.—SCENT.

A fox-hunter writes to the *Times* that the scent of the fox emanates from a sub-caudal gland, and not from the pads, as is commonly supposed.

This opens up an interesting, though unsavoury, field for enquiry. It is probable that all canine species are similarly provided, and observation might elicit whether this is characteristic of all animals.

In following up a wounded Indian wild dog in the Melghat Forest in 1891, I observed a strong ammoniac secretion, which had exuded on to the tail, and the scent of which could be detected from a distance. When the dog was brought to bag, an aboriginal Kurku, observing this, remarked that in pursuing its prey the wild-dog flicks poison with its tail into the eyes of its victim, thus blinding the animal. The Kurkus were eager to obtain the wild dog's liver to make medicine, ascribing to it aphrodisiac properties.

R. G. BURTON, COL.

*10th December 1919.*No. V.—FOOD OF THE GREY MUSK SHREW (*CROCIDURA CÆRULEA*).

According to Blanford (Mammalia, Fauna of British India), the food of this shrew consists mainly of insects and he says that "experiments made by Anderson on individuals kept alive by him showed that they refused to touch any kind of grain, but devoured insects, especially cockroaches, freely and he found no vegetable food of any kind in the stomachs of several he examined". I have recently had a large number of these shrews caught in my garden, as I found small holes made in the grass lawn. As a result I have caught more than 40 of these shrews and in several cases the bait in the traps—Cocoanut—was in the mouth of the shrew when the trap killed it. The holes in the lawn appear to be made for the purpose of digging up the roots of the 'binli' grass and I found a lot of this grass lying on the ground, bitten off just below the surface of the ground. The roots of the 'binli' are bulbs which go down several inches into the ground and it may have been these bulbs that the shrews were after.

In any case I think it conclusively proves that these shrews also eat vegetable matter.

W. S. MILLARD.

BOMBAY, MALABAR HILL,

*8th April 1920.*

## No. VI.—EXPECTED PLAGUE OF FIELD RATS IN 1920.

With reference to Mr. L. J. Sedgwick's note at p. 661 of Vol. XXVI of our Journal on the above subject, and Mr. J. Davidson's note on the same at p. 1041 of the same volume, through the kindness of The Hon'ble Mr. P. J. Mead, C.I.E., I.C.S., I have been favoured with an inspection of these records from the Bombay Secretariat—Part II, P. W. D., Famine Relief Works—Destruction of rats in the Eastern Deccan, October 1879 to May 1880—and a perusal of these records furnish some interesting details which I give below.

## HISTORY OF THE PLAGUE OF FIELD RATS AFTER THE FAMINE OF 1877-78.

The Rat Plague appears to have been confined to the area known during the last famine (1877-78) as famine districts, *viz.*—

Nasik.	Satara.	Kaladgi (Bijapur).
Khandesh.	Sholapur.	Belgaum.
Poona.	Ahmednagar.	Dharwar.

The remaining nine districts of the Presidency, namely,

Ahmedabad,	Surat,	Kolaba,
Broach,	Kaira,	Ratnagiri,
Panch Mahal,	Thana,	Kanara,

having been altogether free from this pest.

## DATES OF COMMENCEMENT OF RAT-PLAGUE.

The appearance of these vermin seems to have first attracted notice in November 1878 in the Sholapur Collectorate and in the ending of December of that year they appeared also in Kaladgi Collectorate. The Collector of Poona dated their first appearance as late as February 1879, and they occurred at the same time in Ahmednagar District. I cannot find any trace of when they were first noticed in Dharwar, the district which suffered most from this visitation.

The Collector of Kaladgi (Mr. Middleton) states that "the heavy rainfall during the later monsoon had fostered the growth of weeds in the crops which otherwise promised an abundant harvest but for the appearance of rats. For many years there had not been a year in which they could have done so much damage as they did this year (1879). The crop was far above the average and the loss was on that account greater. The origin of the plague is not satisfactorily accounted for. Superstition attributed it to the vengeance of the famine victims whose ghosts returned in the form of rats to claim the food for want of which they had perished. A more credible cause is that the rats, which always abound, found safety and were able to breed in enormous numbers on the fields formerly cultivated but left waste by the deaths of the cultivators during the two previous years. They found shelter while their enemies, the birds of prey, had not increased in equal numbers. Snakes which are useful in destroying rats had probably decreased owing to the absence in 1876-77 of the grass and vegetation which are necessary to conceal them."

## BREEDING SEASON.

The plague of rats appears to have temporarily increased after the breeding season at the close of the monsoon, 1879.

The first letter in reference to the decrease of the pest is from the Collector of Sholapur to the Commissioner, Central Division, Poona, dated 3rd October 1879 and mentions that "the number of these vermins had decidedly decreased. Formerly one Waddar would bring in 70 to 80 in a



day, but now the same man will only get perhaps 20. This is so far satisfactory, but I would point out that the present is the breeding season and that in each hole may be found nests of young rats which was not the case in the hot weather or even in July."

As regards the breeding season, Mr. Elphinstone, Acting Collector of Dharwar, in a letter to the Commissioner, S. D., dated 3rd November 1879, says: "the breeding season for rats has commenced a few weeks ago and that in consequence enormous numbers of them are now being killed." He goes on to say that the season is very favourable for cotton sowing "and it would be a pity to endanger what will otherwise be a bumper crop by allowing the rats, which destroyed the American cotton last season, to multiply, which they are still likely to do if the period of rewards is not extended one fortnight longer, say to the 30th instant." In a subsequent letter, dated 6th November 1877, from Mr. J. Elphinstone, it is stated that the number of rats killed during the week ending the 1st November had "again increased to the enormous number of 360,680 and if the period for killing rats is not extended to the end of December the havoc caused by these vermin among the rabi crops is likely to be very great. If Government withheld help at this critical time all the money that has been extended by Government up to the present moment may be lost. The breeding season of rats has commenced in real earnest and I am informed by the District Officers here that the great numbers that are killed, nearly all are young rats."

A Government Resolution, dated 13th October 1879, runs as follows:—

"Owing to the enormous numbers of rats which still threaten the crops in the Dharwar districts, no less than 412,024 having been destroyed in the week ending 27th September 1879, Government are pleased to extend the period of rewards for the extermination of these vermin up to the 15th November 1879."

#### TERMINATION OF THE RAT-PLAGUE.

The plague of rats diminished about the end of November 1879 and terminated about January 1880.

#### SPECIES OF RATS.

There appears to have been three species of rats concerned. The Collector of Sholapur reported that "he saw in January 7th, 1879, fields, especially those with groundnuts, completely burrowed by rats and whatever crop was obtainable was that which was dug out of the burrows. The rats were of three species, a small black rat, a larger one and a brown rat or Jerboa. The last is by far the most destructive and it is a serious question for the future if it lives and multiplies. It digs its hole or burrow on higher uplands and in hard soil so that it may not be affected by rain and drowned. The other rats frequent black soil and perish during the rains."

The Collector of Nasik (Mr. Ramsey) reported that he did not consider the vermin to be a rat, but a species of Jerboa, a purely grain eating animal which is found more or less in the Deccan. He attributed this sudden appearance to the exhaustion of the grain stores in underground preserves, termed "Peos" on which these animals used formerly to subsist, and failing this they betook themselves to standing crops.

#### DAMAGE CAUSED BY THE RATS.

The damage done by these pests was enormous. The Collector of Kaladgi wrote that "the devastation committed by rats was so great that in February 1879, immigrants poured into Kaladgi from the Nizam's territory and relief works were opened in April 1879. It was expected that the rats would perish in the heavy rains of the monsoon, but the

rains held off until past the middle of July, and when the fields were sown the seed was scratched up and devoured by rats."

### METHODS OF EXTERMINATION.

Various methods were resorted to in endeavouring to exterminate the rats.

The Collector of Poona (Mr. Richey) reported in July and August, 1879: "Phosphorous paste balls were tried for their destruction in the Indapur taluka, but were found to be utterly ineffectual."

The Collector of Ahmednagar (Mr. King) stated that endeavours were made to extirpate the rats with the Burmese method of catching them and also by suffocating them with fumigation, but neither succeeded.

The Collector of Sholapur writes: "other methods such as by asphyxiation and sulphur squibbs were also tried. They were successful as far as they went but would have suited more for a farmstead than for wide country. The disappearance of rats is traced to—

1. Their destruction by the above modes.
2. Rain having choked their holes.
3. A species of vermin or tick which has killed them off."

The most effective of the various measures appears to have been the catching of the rats by the Waddars.

The Collector of Poona writing in reference to this says: "the only agency for their destruction in great numbers was that of the Waddars. These were at first reluctant to offer their services in the hope that the reward of one rupee per 100 rats killed would be increased, but when they were refused employment on relief works, they took to rat killing. The destructive operations continued in this district till 27th December 1879; when the total number killed stood at 365,766 at a cost to Government of Rs. 3,643-13-1."

In a letter, dated 3rd November 1879, Mr. Elphinstone, Assistant Collector of Dharwar, writes: "Waddars employed are the only people who are able to do much execution among the rats. The rats destroyed the American cotton last season, the breeding season for rats commenced a few weeks ago and enormous numbers are in consequence now being killed."

On the 20th January 1880 he reported that rewards were only paid after comparison with the rats or rats tails which were burnt or cut in pieces and buried in the presence of the Mamletdars or the head Karkuns.

### TOTAL NUMBER OF RATS KILLED.

The following shows the number of rats killed in the different districts:—

<i>Districts.</i>	<i>Rats killed.</i>
Nasik .. .. .	243,551
Khandesh .. .. .	4,742
Poona .. .. .	365,766
Satara .. .. .	29,427
Sholapur .. .. .	1,163,019
Ahmednagar .. .. .	1,767,414
Kaladgi (Bijapur) .. .. .	4,130,209
Belgaum .. .. .	135,226
Dharwar .. .. .	7,132,453
Total .. .. .	14,971,807

I give below extracts from the opinions as to the methods adopted for the extermination of the rats.

Report made by the Acting First Assistant Collector, Dharwar, dated February 2nd, 1880: "That this marvellous decrease in the numbers of



rats had resulted from the measures taken in consequence of this issue of the Government's order about rewards cannot well be doubted. On all sides I am told so, as if it were a matter that admitted of no doubt whatever. The cultivators as a body are (it would appear) assured that it is so."

The Collector of Kaladgi writes (21st February 1880): "The destruction of rats brought about by the offer of rewards was most beneficial. They might perhaps have died afterwards from natural causes but they were killed sooner and the destruction of upwards of 4 millions of rats must have saved the crops to a vast extent. Besides the payment of their rewards enabled large number of people who would otherwise have been thrown back on Relief works to support themselves and the money was as profitably spent as any sums were during the famine." The total number of rats killed in the Kaladgi district was 4,130,209. Total rewards paid Rs. 40,437-7-9.

The Collector of Ahmednagar (Mr. King) was by no means sure that their numbers were very appreciably reduced by artificial means. He writes: "Rain is very effectual in killing the vermin either by drowning or causing the soil to swell and to close the burrows. Frost in November and December also appears to have killed them."

The Commissioner, Central Division (Mr. Robertson), "was told that shortly after the rains, in many villages in the Shrigonda taluka, large numbers of rats were seen dead outside, and even in their holes, covered with a species of tick which appears to have killed them in large numbers. Ticks do not attach themselves to dead bodies. On enquiry it was reported that red ticks fastened themselves on the rats while alive and caused their deaths."

The Collector of Poona writes: "the plague has now (21 February 1880) ceased and in the Collector's opinion the rapid fall in numbers killed is not owing to rats having been virtually exterminated but is probably due to natural causes."

The Collector of Sholapur considers that if the rats had not been killed the plague would have ceased all the same but the damage would have been far greater. Possibly the later monsoon rain killed them off, but Mr. Spry is sceptical as to the tick theory.

Khandesh, Satara and Belgaum suffered much less than the other districts referred to.

It appears from the above facts that the concensus of opinion was that the cessation of the plague of rats was due to natural causes and not to the measures which were taken by Government to exterminate them, but it is admitted that the measures by which some 15 million rats were destroyed provided relief for starving people and that they probably saved a large amount of damage to the crops. It is not clear that the ticks were the cause of the rats' disappearance. In regard to the anticipated plague in the cold weather of 1920-1921, the question arises is prevention possible now? Would it be worth while to employ the Waddars in one or more of the districts which was most affected by the famine of 1918-19 to catch the rats now in order to prevent a plague occurring next cold season?

The Mammal Survey which our Society has been carrying on elicited a great deal of valuable information as to the various species of rats found and I should like to endorse Mr. Kinnear's appeal that specimens of all these rats should be sent to our Society, since by determining to what species they belong and their life history, it may be possible that in the future some efficient measures may be feasible to prevent such plagues occurring in the Presidency.

W. S. MILLARD.

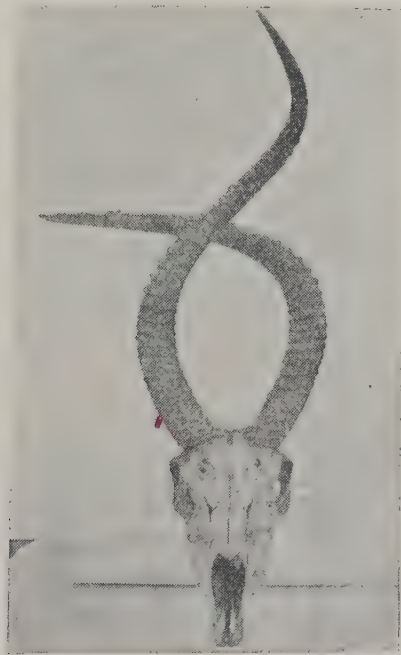
BOMBAY, *March* 1920.

No. VII.—FEMALE BLACK-BUCK (*A. CERVICAPRA*) WITH HORNS.

I enclose photo of a freak Black-buck doe shot by me in the Mainpur District (U. P.) in 1908. . . . . I am sure the photo will interest members of the Society.

FATEGARH, U. P.,  
31st January 1920.

E. G. BROWNE.



[We publish the photo of another head of a female of Black-buck with horns received from Mr. G. J. Griparis. The animal was shot by him at Amraoti, Berar. Further instances of this nature are recorded in our Journal, Vol. XXIII, page 354—Eds.]



No. VIII.—ABNORMAL SAMBHAR HORN.



I enclose a photograph of an abnormal Sambhar Antler in the possession of E. A. Sweetenham, Esq., of the Somerford Orchard, Ramgarh, Naini Tal District, U. P. He got it from a man at the foot of the Hills and the latter said that the Antler had been picked up in the Bhabar, a tract between the foot of the hills and the lower-lying Terrai further to the South. I have never seen anything like this type of abnormality. There seems to me hardly any doubt, but that the animal who carried this, or a pair of such Antlers, must have been a Sambhar as the beam and tines are clearly of this variety of the stag or deer family.

The dimensions are as follows:—

Round beam just below the place where the abnormal growth begins .. .. .	8½ inches.
Round beam just above burr.. .. .	7¾ ”
The outer curve to tip of longest tine .. .. .	33 ”
The abnormal growth measured in a direct line from beam is about 6 or 7 inches.	
The length is a fair size of Antler for the locality though larger have been seen.	

ST. QUENTIN, NAINI TAL, U. P.,

G. TATE.

16th August 1919.

[Further references to abnormal Sambhar horns may be found in our Journal, Vol. XVII, pages 845, 846 and 1020 and Vol. X, p. 534.—EDS.]

#### NO. IX.—BIRDS OF DIFFERENT SPECIES NESTING IN COMPANY.

With reference to Mr. Allen's note on page 1044 of Volume XXVI, it may be of interest to record that in the Perozpore District on the 31st May I came across a medium sized Shisham tree containing nests as follows:—

About 15 feet up. The Black Drongo (*Dicrurus ater*), 4 eggs.

About 1 foot higher up. The Red Turtle Dove (*Oenopopelia tranquebarica*), 2 eggs.

About 4 feet higher still. The Southern Green Pigeon (*Crocopus chlorogaster*), 2 eggs.

And finally, about 30 feet up, the Madras Red-vented Bulbul (*Molpastes hæmorrhous*), no eggs but bird sitting in nest.

The tree was in the compound of a Canal inspection bungalow, and, like many others in the compound, had partly withered for want of water, the bungalow being situated on a sand hill well above the level of the Canal. Below, on both banks of the Canal were rows of fine trees, providing, one would think, far more suitable nesting sites. I imagine that the Drongo chose the withered tree, and the others followed suit to obtain the benefit of his efficient "Chowkidari".

LAHORE,

12th April 1920.

H. W. WAITE,

Indian Police.

#### NO. X.—CURIOUS NESTING SITE OF THE INDIAN HOPOE (*UPUPA INDICA*).

There is adjoining the cattle pound at Chakwal in the Jelum District a mud building used for storing *bhusa*. This has no windows and a single door, which does not fit properly. The building remained empty for some time, and although the door was kept fastened there was room enough between it and the threshold to allow Hoopoes to creep in and out, which they were seen doing on several occasions. Eventually, on the 8th May, the door was opened, and 8 Hoopoe's eggs discovered, laid amongst the litter of *bhusa* on the floor.

LAHORE,

12th April 1920.

H. W. WAITE,

Indian Police.

#### NO. XI.—BREEDING OF BLACK-NECKED STORK. (*XENORHYNCHUS ASIATICUS*).

I send you the following note as it may be of interest. On the 10th December last, I saw from my tent door a Black-necked Stork,



*Xenorhynchus asiaticus*, standing on the edge of her nest. She had just flown up from the jheel a little way off and after a bit she settled herself into the nest. I was unable to visit the nest then but next morning I went to the nest, taking a man to climb. The bird was on the nest but flew off as the man went up. On his approaching the nest, to my surprise two nearly full grown young birds got up in the nest, and as the man got close, flew off; they were very shaky and wobbly, evidently their first and a 'forced' flight. The man went on to the nest, and to my surprise said there was an egg. I told him to bring it down, thinking it was an addled one, but on his reaching the ground I saw there were two eggs. On blowing them they proved to be perfectly fresh. Surely this is most curious?

GONDA, 11th March 1920.

F. FIELD.

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### No. XII.—EGRET AND LIZARD.

I witnessed this morning what appeared to me a rather astonishing performance on the part of a common white Egret (Paddy bird or *Bogla*.)

When I first noticed it, it had caught either a Chamaeleon or a Lizard at least a foot long. This creature was struggling furiously in the Egret's bill. It repeatedly succeeded in escaping but was always recaptured after running a few yards. After a bit its struggles became feeble and I noticed that it was then always caught by the head, whereas at first the bird caught it by any portion of the body it could catch hold of. The Egret now started to try and swallow its head first. The head and front legs went in but it began to struggle furiously with its hind legs and long tail sticking out. The commotion that went on in the bird's neck was now extraordinary to witness. It looked as if the lizard's head or legs must break out through the neck. Several times a black patch appeared on the neck of the bird which looked like the lizard's head coming through but it was only that the skin was stretched very tightly and the colour of the lizard or skin showed through the feathers. At last after fearful efforts the hind legs also went down. The bird then stood working its neck, in which the bulge could still be seen, up and down for about ten minutes. After that it flew away none the worse. When the bird stood holding the lizard in its bill the latter looked quite as long as the bird itself and I would never have believed it could have been swallowed.

KHUMTI, RANCHI DIST.,  
CHOTA NAGPUR, 13th May 1919.

H. R. MEREDITH, I.C.S.

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### No. XIII.—COMMON POCHARD (*N. FERRINA*) AT BANGALORE.

Last Sunday Captain W. Le C. Brodrich while out with me shot a male Common Pochard (*Nyroca ferrina*) in full plumage. Is it not very rare for this bird to be found so far south as Bangalore? Both Oates and Finn say that he is not found south of Bellary.

BANGALORE, 10th March 1920.

E. O. KING, CAPT., I.A.R.O.

[Stuart Baker in "Indian Ducks and their allies" says that the occurrence of these birds in Mysore is very rare—Eds.]

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### No. XIV.—MESOPOTAMIAN BIRD NOTES.

With reference to the Revd. F. C. R. Jourdain's remarks on my notes on Mesopotamian birds, I submit the following in reply.

Previous to collecting for the British Museum I collected for the Karachi Museum, sending specimens from Ormara (Mekran), Bushire (Persia) and Fao (Mesopot).

Among the specimens sent to the latter institute, was one of a Warbler, which was identified as *Scotocerca inquieta* or to be more correct that name was supplied to me for the specimen sent; at the time I was not in a position to know that this was an error and accepted the identification as being correct, hence my labelling the eggs sent to the British Museum as belonging to this bird. It was only on receiving Dr. Bowdler Sharpe's list published in the Ibis that I knew an error had been made.

Some years later I came to know that some of my specimens from the Gulf got mixed up in the Karachi Museum with some others collected in Sind, with the result that certain specimens from the Gulf were included in the Sind Fauna, and I conclude a specimen of *Scotocerca inquieta* collected in Sind, was taken as part of my Fao collection, which will account for the wrong name being supplied to me.

As to Mr. Jourdain's remarks that *Hypolais pallida* and not *H. languida* breeds in Fao, he is probably correct, for I accepted Dr. Bowdler Sharpe's identification and concluded, without examination, that all the *Hypolais* were *languida*, as certainly were the two I sent home, thus having as I thought established the breeding of *H. languida*.

*Lanius fallax*, I cannot see that confusion is made worse; Dr. Sharpe originally identified my specimen as *fallax*, later on he thought he had made a mistake and changed the identification to *assimilis*. These names were widely used at the time, but since the revision of nomenclature they have been discarded for the prior names of *aucheri* and *pallidirostris*, respectively, both of which birds are known to occur in Mesopotamia. At the time Dr. Sharpe wrote, these grey shrikes were not so well understood as at present and his confusion of the two races is understandable. As to which race my specimen belongs, Mr. Jourdain can easily satisfy himself, as the specimen should be in the National Collection.

Hartert in "Die Vogel des Paliartic Fauna", page 450, gives *fallax* as a synonym of *L. aucheri*, 1853, and on page 429 *ibid* states "*assimilis*. Brehm. 1854—*pallidirostris*. Casein 1852".

Cumming's Chat—I did not know such a bird existed till about 1908, when asked by a Collector for some skins of *S. cummingi*—the red-tailed Chat—beyond this I knew nothing of the bird till within a few months ago Capt. Ticehurst gave me a description and particulars of it. Dr. Bowdler Sharpe never informed me of the correction and as he identified all my specimens sent to the British Museum, I naturally concluded that on going over the chats at a later time, he identified the bird as new and named it after me.

I have always felt that this would prove to be an individual variety, until I found out that Dr. Hartert in his "Vogel des Paliartic Fauna" states that more than one specimen has been secured.

As to *Garrula*, I do not know what puzzled Mr. Jourdain for as far as I can now recollect, my notes are correct as applying to Fao. The European bird was plentiful as a bird of passage at the time stated, while the Indian bird was a rare visitor actually at Fao, but it may be more plentiful above this station; at no time did I come across more than one or two birds within twenty miles of Fao and then not as a resident.

The nestlings received by me were taken by an Arab about 30 miles up river beyond Fao.

Possibly the Indian bird comes to breed in Mesopotamia for I feel sure the winter is too severe for it to remain on.

W. D. CUMMING.

KARACHI, 7th February 1920.



No. XV.—THE GREAT INDIAN HORNBILL (*DICHOCEROS BICORNIS*).

Members of the Society and others who have had the pleasure of visiting our small Museum will be sorry to learn of the death on Monday evening, the 3rd May, of the Great Indian Hornbill which had lived in the Museum since August 1894 and was always a source of interest and amusement.

"William", the name affectionately given to this bird, was certainly an appropriate one for if ever there was a big Bill it was to be found here. The power behind this enormous beak is used in the case of the free bird for many purposes amongst which may be mentioned the provision of a nest for the breeding season, but in captivity it was principally used to draw attention to its owner's wants and the noise the bird made by hammering at the roof or sides of its cage (an old disused temporary bath-room) would arouse even the most inattentive of its attendants and servants.

There is a story that many years ago a lady was being shown round the Museum by Mr. Phipson, who was then the Honorary Secretary, and on arriving at the Hornbill's cage the lady was told "You know that bird has something in common with some ladies. He paints himself every day" "Ah Mr. Phipson you won't catch me. I have been told of the stories you tell to visitors" was the lady's reply. Mr. Phipson's was "My dear lady it is the first true story I have told you since you entered the Museum." Whether it was the first or not cannot now be proved but true it was. The Great Indian Hornbill makes good use of the gland, called the 'Uropygial,' above the tail feathers from whence exudes an oily yellow pigment. The bird laying back its head on to the gland would cover its big casque with the yellow paint and take great pride in the operation. The pigment no doubt served to preserve the horny substance of the casque for it is a curious fact that whilst the bird has been named from dead specimens the "concave" casque hornbill—in the living specimens the casque is convex. In the dead specimens the centre of the casque has collapsed.

The Hornbill's original home was Karwar and he was presented to the Society in August 1894 by Mr. H. Ingle. In his early youth "William" was a famous cricketer and could be relied on to equal a Presidency cricketer in his capabilities as a field. Of late years, owing either to old age or perhaps approaching blindness, he seemed however unable to catch anything and the old system of feeding had to be changed and, instead of the fruit on which he lived being thrown to him, the dish had to be held up to him from which he would select those fruits which seemed to his sensitive beak to be sufficiently succulent. In the day time, when he could be observed, "William" hardly ever condescended to take food placed on the floor of the cage.

On only one occasion did this Hornbill ever depart from his life long abstinence from drink of any kind, and on the occasion in question it was *force majeure*. He had playfully extracted a lighted cigar out of a friend's mouth and swallowed it. Mercifully the cigar was promptly extinguished in the process as in order to make the bird disgorge, brandy was poured down its throat! All the liquid nourishment these birds require is obtained from the fruit they eat.

"William" was supposed to have been about six months old when he came to Bombay—so was about 26 years old at the time of his death. He has been carefully skinned and will be sent to England to be mounted by a skilful taxidermist and will eventually occupy a prominent position in the Natural History Museum which it is hoped Government will soon build.

R. A. SPENCE.

No. XVI.—SUPPRESSION OF THE NAME OF THE SNAKE  
DESCRIBED BY ME AS *OLIGODON EVANSI*.

In Volume XXII, page 514, of this Journal, I described a new snake under the name *Oligodon evansi*, the type of which was preserved in our Society's collection. Mr. Prater has drawn my attention to the similarity between this and specimens of *Trirhinopholis nuchalis* Boulenger, and suggests that *Oligodon evansi* is not a valid species. I have revised my notes, and find that Mr. Prater is quite correct, so that my name calls for suppression.

BANGALORE, 3rd May 1920.

F. WALL, LIEUT.-COL., I.M.S.

No. XVII.—OCCURRENCE OF THEOBALD'S KUKRI SNAKE  
(*SIMOTES THEOBALDI*) IN ASSAM.

Among the snakes recently presented to this Society by Mrs. Jackson, Tura, Assam, is a specimen of *Simotes theobaldi*. Dr. Boulenger in the Fauna of British India, Reptilia, gives Pegu, U. Burma, as the habitat of this species. Its occurrence in Assam is worthy of record.

BOMBAY NATURAL HISTORY SOCIETY,  
3rd March 1920.

S. H. PRATER.

No. XVIII.—COBRA WITHOUT THE CUNEATE SCALE.

Since getting back here I have looked up my notes about the cobra whose head I left with you. It was killed on April 1st, 1920. It was 3'-6" long and had all normal characteristics except it lacked the cuneate scale. I may note that it had no ocellate marks (var *cæca*). I have now had 14 cobras (the longest 5'-2½") brought me here and not one has had ocellate marks. At Manpur (14 miles south of Mhow Cantonment) which I left in March 1919 I used to get both *cæca* and *typica*.

The other cobras I saw in the Museum which had no cuneate scale were not the ordinary species but banded (*fusciata*). So perhaps this case is unusual.

BHOPAL AGENCY, SEHORE, C. I.,  
17th April 1920.

C. E. LUARD, LT.-COL.

No. XIX.—ON THE BREEDING OF THE CHECKERED WATER  
SNAKE (*TROPIDONOTUS PISCATOR*.)

On April 15th I had a *Tropidonotus piscator* ♀ (var., *quincunciatus*) brought me. She was brought alive with 80 eggs. These examinations shewed were quite lately voided. Each egg was ½" to ¾" long, white, but not glossy. As this seems late in the year I record it.

BHOPAL AGENCY, SEHORE, C. I.,  
17th April 1920.

C. E. LUARD, LT.-COL.

No. XX.—THE MYSTERIOUS 'JHOOR.'

During a recent tour through the Gir Forest I overheard a conversation between the forest guards and the cattleherds regarding a strange beast that is supposed to inhabit the deep pools in the forest rivers. I questioned a large number of men who have spent all their lives in the Gir, including Hebat Jamadar, the famous old warder of the lions (now very old, feeble, and probably ninety years of age) and made the following notes. It would be of interest to know if such a belief exists in other parts of India.

"The beast is named the Jhoor, lives in the deep rocky pools scoured out in the beds of the big rivers, and is very seldom seen as it never leaves the water. Hebat and two other men declare they have seen it. It pulls



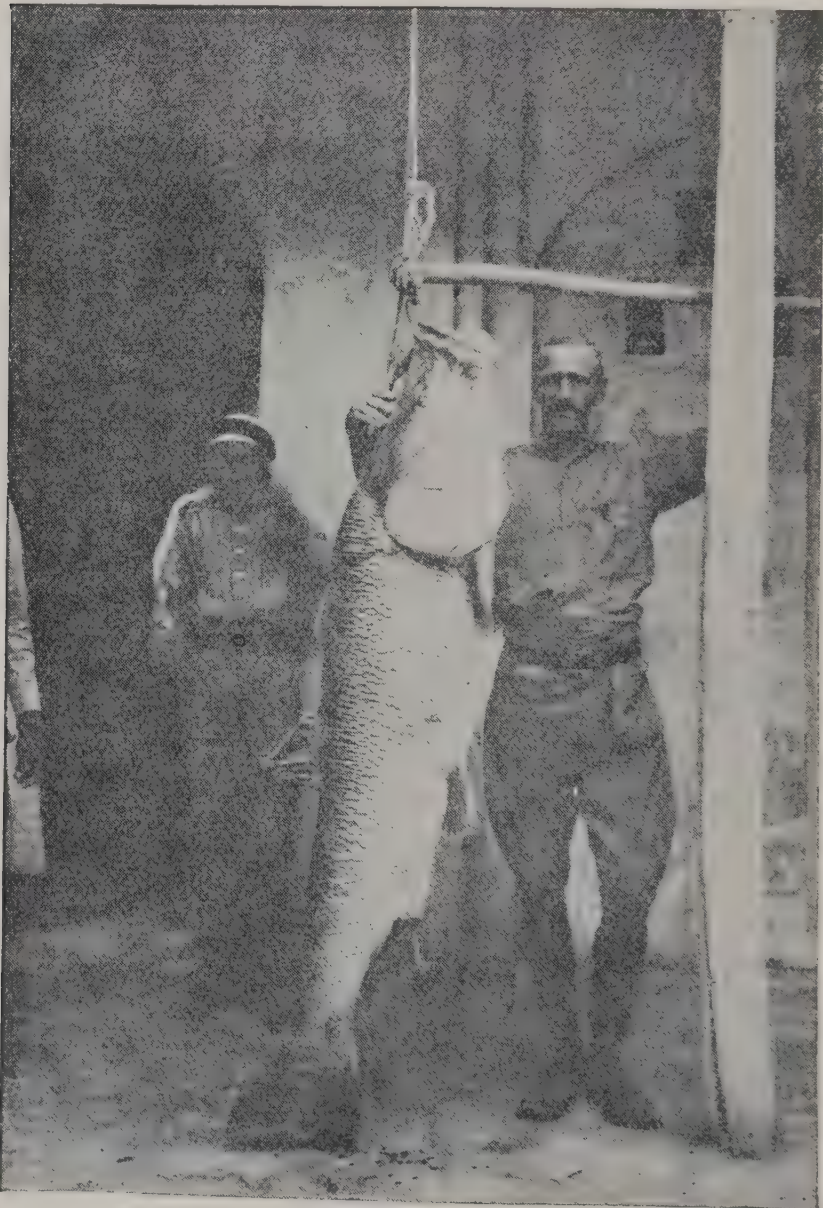
in the largest buffaloes when they go down to drink. If the buffalo should be recovered after a few days, nothing but the skin and bones remain, with a large puncture in the abdomen through which evidently the flesh has been extracted. The Jhoor has a body closely resembling a large turtle, with a long neck, and snake-like head, and four very long flexible legs or tentacles. It seizes its victims by the nose and winds its tentacles round the four legs, places its carepace under the chest of its prey, and levers it into deep water."

I am of opinion that this strange beast is a myth. The deep pools are infested with huge crocodiles which are very destructive to cattle and pull in the largest buffaloes. In several places villages have been deserted owing to the decimation of the flocks by crocodiles at the drinking pools, and the danger of children being dragged in. The Jhoor, I am afraid, carries on his head the sins of his more tangible brother, the crocodile.

JUNAGADH, 4th March 1920.

E. BROOK FOX.

No. XXI.—LARGE CARP FROM MESOPOTAMIA.



I enclose a photo, which may be of interest to you of a 140 lb. Tigris Salmon (so called) which I caught on a 2" spoon at Samarra on 21st

September 1919. I believe this to be a record as regards the size of the fish caught *spinning*, though I know much larger ones have been caught on meat and "atta".

The fish is a species of Barbel, but I should like to know its correct name.

HEAD QUARTERS, 17TH DIVISION,

F. B. LANE, MAJOR.

MESOPOTAMIA,

1st November 1919.

[Photos of large Carp from Mesopotamia appeared in our Journal, Vol. XXVI, No. 2, p. 679. The name of the fish is *Barbus seich*—EDS.].

#### No. XXII.—A NEW HAWK MOTH.

When on leave in Mussoorie in 1918, I found eggs of a Hawk moth, and young larvæ. Being suddenly ordered away, I only obtained two moths, one of which was later smashed up in the post. The last one reached home safely, and proves to be a new species.

If any member who is visiting Mussoorie or other stations close by during the rains would care to help, I will let him know where he can get eggs and larvæ. The British Natural History Museum would like a series of moths, and incidentally he could get some for himself and the Society. The larvæ are easy to rear, or if eggs were sent to me I would rear them.

F. B. SCOTT, MAJOR, I.A.

FERNDAL, SHILLONG,

2nd March 1920.

#### No. XXIII.—STRANGE FIND OF THE LARVA OF THE BUTTERFLY (*TEINOPALPAS IMPERIALIS*).

I was riding up to Sukia, elevation 6,050 feet, when upon the road I chanced to see this fine Caterpillar almost under my pony's foot. I at once jumped off my pony and secured this unknown specimen, unknown then to me, as I had often wished to get this larva of this fine Butterfly, but without success from the Lepcha collectors. What the Caterpillar was doing on the road puzzled me but alongside was a big Oak tree and I had been told the larva of this insect fed on the Oak so it may have fallen down after being attacked by some enemy bird or lizard. I was also aware the larva fed on *Daphne nepalensis*, a large shrub, the bark used by the Nepalese to make a coarse paper, the wood sweet scented. Close at hand, as I expected at this elevation, I looked for several shrubs and found *Daphne papyracea* or *Wallichia* (Chota Aryili, Nepalese) and it may have been the Caterpillar was making for one of these. Anyhow the larva looked fairly full grown. Plucking the leaves of the Oak and "Daphne" I put the insect into a fairly big box with plenty of air holes. The Caterpillar was green with a large thick head, Papilio-shaped, the tail was certainly aggressive when I took hold of it from the ground which made me think I had got some Spingidæ larva yet new to me. On my return home from Darjeeling 2 days after I was exceedingly pleased to find the Caterpillar had turned into a soft pupa, a shape new to me, oval greenish with a strange horn, this was enough to show me that it was no "Sphingidæ" larva. The date of turning would be the end of September 1918. The perfect Butterfly did not come out until the following April 1919. 7 months in the pupa state. Whether this insect is second brooded is difficult to say, but I am inclined to think it is. Senchal is the favourite hunting ground, catches are mostly made in August and end of July by Lepcha collectors.



In Lieut.-Colonel Bingham's book, Volume II, Butterflies, page 9, it is recorded

"The larva of this magnificent butterfly, according to Mr. Knyvett, feeds on *Dhaptys nipalensis*, but so far as I know no description of it has been published".

I trust to get hold of some larva this year as well as the larva of other interesting Papilios.

OSCAR LINDGREN.

TURZUM TEA ESTATE, NAGRISPUR P. O.,  
DARJEELING HIMALAYAN RAILWAY,  
April 1920.

No. XXIV.—LIFE HISTORY OF THE "BUPRESTID" LEAF  
MINER (*TRACHYS BICOLOR*, *KERREMANS*)  
A PEST ON *BUTEA FRONDOSA* IN MYSORE.

(With a plate).

INTRODUCTION :—*Butea frondosa* trees (Dhak or Palas) are subject to the attack of several insects, viz., leaf eating caterpillars falling under Limacodids, Lycænids and Sphingids, Coleopterous insects such as snout beetles or weevils, and Buprestid beetles and pentatomid bugs. All the above are only very minor pests excepting the Buprestid Beetle—a leaf miner—which is assuming the form of a serious pest in the majority of the places where *Butea* are found in Mysore State. The injury to the plants consists in that the adult beetles feed on the leaves of the plant and that the grubs pass their life as leaf miners feeding on the leaf tissue and forming regular pockets in the leaves, the leaves having a blistered appearance. Almost all the leaves of a plant are affected, they are unable to perform their normal functions, and they look quite dry without even a tinge of green matter and as a consequence many of the plants kept under observation for 4 or 5 years have never made any appreciable growth at all on account of this.

*The adult.* This beetle is a small oval wedge shaped creature, the head and thorax being of a bronzy colour, the rest of a steel blue colour, with 4 or 5 wavy white lines marked across the elytra. It measures 5.25-5.5mm. lengthwise and 3.25-3.5 mm. at the broadest part. The beetles are hard to recognize on the plants as they cover themselves up with their excreta and thus resemble the droppings of some small birds. The beetles are commonly found on the plants from about the end of April or the beginning of May and egg-laying and continuous breeding begins from now and continues up to about February-March. There occur as many as 4 or 5 broods in a year.

*Oviposition.* The female beetle moves about the upper surface of the leaves before egg laying and when a spot is selected at the angle formed by the junction of one of the veins with the midrib on the upper surface of the leaves it first scrapes the epidermis of the leaf with the mouth parts, lays an egg and then covers it with the dirty white excreta with which the beetle is covered. The flattened oval eggs are laid singly as well as in groups of 2 or 3, sometimes 4 or 5 on the upper surface of the leaves. When the eggs are laid in groups they are usually laid overlapping one another.

*The Egg.* The newly laid egg is colourless, flat, oval and measures 1.75 mm. to 2.25 mm. at its long axis and 1.25 mm. to 1.75 mm. at its short axis. The egg remains colourless for 5 days and on the 6th day it turns to a shining black colour and now the dirty white excreta with which the egg is covered is plainly distinguishable. 13 days after the egg turns to black, i.e., 19 days from egg-laying, the egg hatches out.

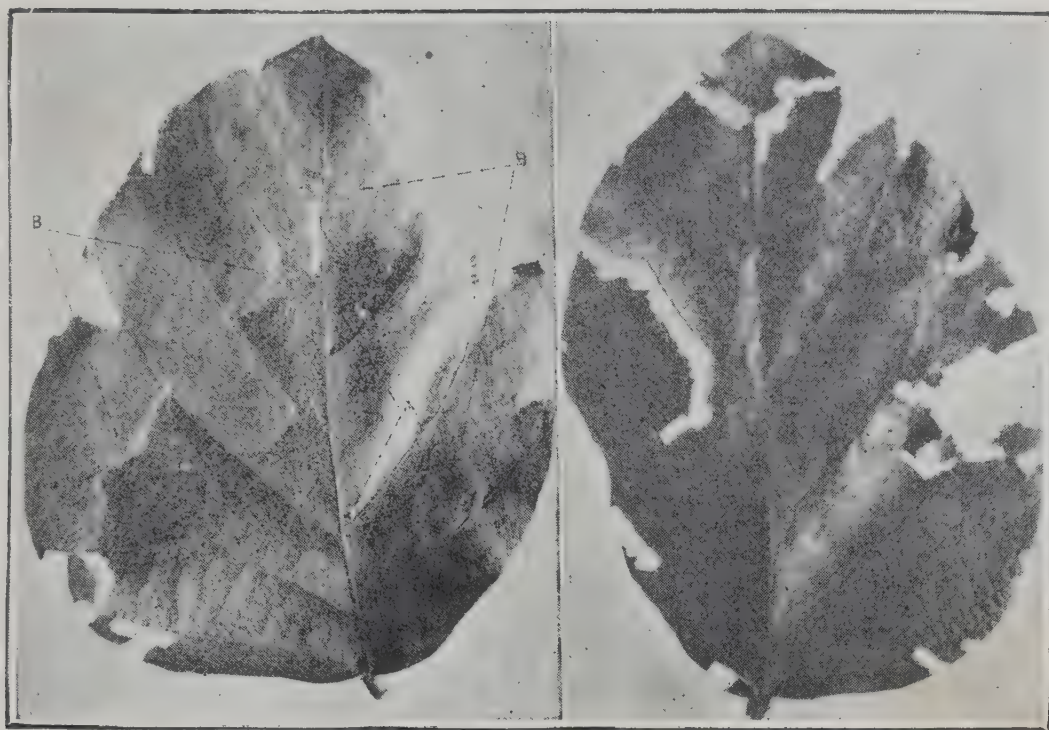


Fig. 1. A. Eggs of the Beetle.  
B. Pockets in the leaf made by the Grubs.

Fig. 2. Injury to the leaf by the adult Beetles.

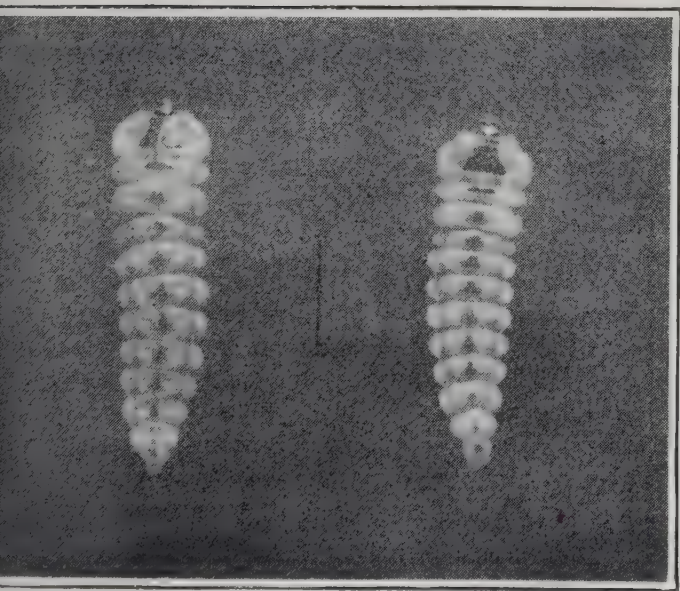


Fig. 3. Full grown Grubs.



Fig. 4. Adult Beetles.  
1. Ventral side.  
2. Dorsal side.

THE "BUPRESTID" LEAF MINER (*TRACHYS BICOLOR*, KERREMANS) A PEST ON *BUTEA FRONDOSA* IN MYSORE.





*The Grub.* Immediately on hatching, the grub which is of the characteristic Buprestid form—flat, round, wedgeshaped, large head and thorax and the body tapering to a point at the posterior end—splits open a portion of the underside of the egg and begins to eat through into the leaf tissue. The upper side of the egg remains quite intact. The wedge-shaped, flat front portion of the grub is thrust into the tissue of the leaf and the grub works gradually from side to side consuming the substance of the leaf all the time without in any way injuring the epidermal layers of the leaf and thus a small cavity is formed in the leaf. The grub goes on widening the cavity gradually and feeding for about a month by which time a fairly big pocket about half the area of the leaf is formed and pupation takes place within this cavity now. The newly hatched out grub is 2 mm. long and 1 mm. broad at the broadest portion. It is of a pale whitish colour. The fully developed grub is of a dull white colour with a tinge of yellow and measures 11.5 to 12 mm. lengthwise and 2.75 to 3.5 mm. at the broadest part. The centre of the segments 2nd to the 10th behind the head in the grubs, both on the dorsal and ventral sides are marked with peculiar markings in black resembling "shirt" buttons. The larval life is 29 days.

*The pupa.* Pupation takes place in the larval chamber. The pupa is flat and brownish in colour and is 6 mm. long and 3.5 mm. broad. The pupal life lasts 9 days. The adult beetle on emerging from the pupal stage remains within the chamber for a few hours and then bites a hole through the lower surface of the chamber and escapes out and begins feeding on the leaves.

*Natural enemies.* Found small black ants *Campylocorus* sp. feeding on freshly laid eggs. A very minute chalcid parasite parasitises the grub. It was found to walk over the upper surface of the pocket of the leaf tapping with antennæ the different portions and finally bending its abdomen to pierce the thin wall of the pocket and lay eggs on the grub.

*Conclusion.* Considering the fact that no mention is made of any insects affecting *Butea frondosa* plants seriously and this is one of the important plants on which lac is raised in India, I venture to record the above facts regarding this insect in the hope that lac growers in India will be particularly interested in the subject.

P. V. SUBRAMANIAM,

ASSISTANT ENTOMOLOGIST,

MYSORE AGRICULTURAL DEPARTMENT.

BANGALORE, 15th March 1920.

#### NO. XXV.—A SHORT NOTE ON THE ATROPHIC ABORTION OF THE INFLORESCENCE OF THE ONION (*ALLIUM CEPA*, L.)

( With two plates ).

In March, 1917, I came across a few peculiar onion bulbs of which three (Figs. 1-4) have been figured here. In external appearance these were indistinguishable from other bulbs of *A. cepa*, but, on closer examination, were found to differ in being easily compressible and in containing abortive inflorescences (Infl.). It is a matter of surprise that no similar case of abortive inflorescence has been either cited or described in either Master's Vegetable Teratology or any other available literature.

Although left for a fairly long time in a grocer's store, curiously enough, these specimens contained inflorescences (Infl.) bearing full-sized (deter-



mined by actual measurement) waxy-white flowers. Fig. 1 shows the inflorescence (Infl.) inside the partially opened bulb of specimen No. 1. Fig. 2 shows the scape (Sc.) (in specimen No. 1) which assumed quite a curious shape. It deviated so much from the type, that, it became solid, fleshy and stunted (its length being only 6.25 cm. whereas a normal scape is 30-60 cm. in length) and it bore the inflorescence along the whole of its left side instead of bearing it on its top. The whole inflorescence thus developed was wrapped up by a membranous covering (Memb.) with prominent parallel nerves. A part of this membrane was found adnate to the left side of the scape. This covering seemed to be nothing but a modified form of a spathe. In the fourth specimen, which has not been depicted here, I noticed two waxy ovate-lanceolate fleshy structures, differing in shape from all the other scale-leaves (SL.), adpressed to the tiny inflorescence (Infl.) inside the bulb. Fig. 3 shows the two kinds of inflorescence (Infl.) met with in specimen No. 2, in which a group of flowers or fascicle (b.) arose directly from the stem below and a small umbel (a), partially hidden by 'b.' was borne by the irregularly zigzag solid scape (Sc) slightly twisted to the left. Except the basal part of a withered normal scape (Sc<sup>1</sup>. seen also in Figs. 1—3) no trace of a fresh scape is seen in Fig. 4, all the flowers (Fl.) having taken their origin directly from the stem (St.). Dissections of the flowers (Fl.) from each of the above specimens revealed the fact that, although etiolation had taken place, owing to the partial exclusion of light, still, the perianth and the sporophylls were developed quite up to their normal size and shape. Except in specimen No. 1 (in which the anthers appeared to have dehisced) the anthers in all the other specimens were found to contain scanty pollen grains. The ovaries ('B' and 'D' in Fig. 5) were provided with either a long-styled (D) or a trifid sub-sessile (B) stigma (intermediate forms being noticeable in some of the flowers) and generally three compressed ovate ascending and minutely pitted ovules ('F' and 'E' in Fig. 5) in each cell. As the ovules, particularly those in specimen No. 1 were quite tough (unlike functionless ovules which are easily compressible) and as in some of the anthers the pollen-sacs were almost empty, it seemed probable that at least some of the flowers were self-fertilised. Here, it is obvious, that, no cross-fertilisation could have taken place at all.

Histological differences between a normal (Sc.<sup>1</sup>) and an abortive scape (Sc. in Fig. 3) were no less marked. The following were the main points worth noticing:—

1. The epidermis (Ep.) of the abortive scape (Fig. 7) was thicker than that of the normal scape (Fig. 6) and was provided with comparatively larger cells, which were not of uniform size and shape throughout. Whereas the cuticle (Cut.) was uniformly thickened in the normal scape, in the abortive scape it was distinctly thicker on the outer or 'dorsal' surface than on the inner or 'ventral' surface. Stomata (Stom.) were often present in the epidermis (very clearly seen in longitudinal sections of the epidermal region) of the abortive scape, whereas no stomata were generally found in that of the normal scape.

2. The ring of sclerenchymatous cells (Scl.) in the abortive scape (Fig. 7) in which the vascular bundles (V. b.) lie scattered, was composed of cells having walls thicker than of those in the normal scape (Fig. 6).

3. The vascular bundles (V. b.) in the abortive scape (Fig. 7) were numerically less than those in the normal scape (Fig. 6), but proportionately greater for the area supported by them.

4. Two distinct groups of large vascular bundles (V.<sup>1</sup> b.<sup>1</sup>) were found developed in the ventral area near the centre of the solid abortive scape (Fig. 7), whereas in the normal scape (Fig. 6) the central portion was hollow.

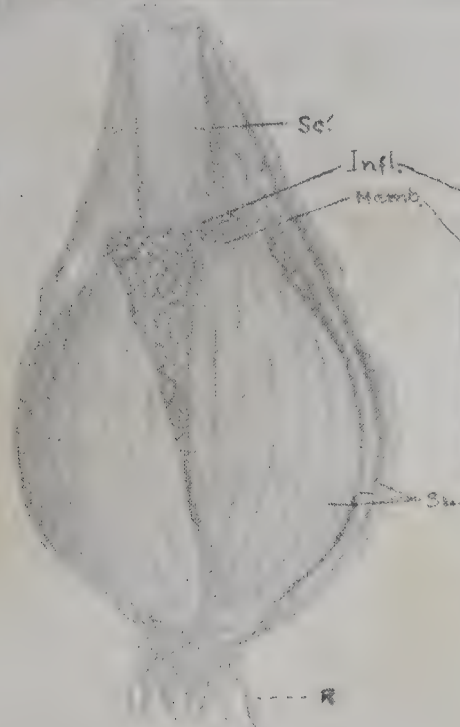


Fig. 1  
(specimen no. 1)  
NAT. SIZE.

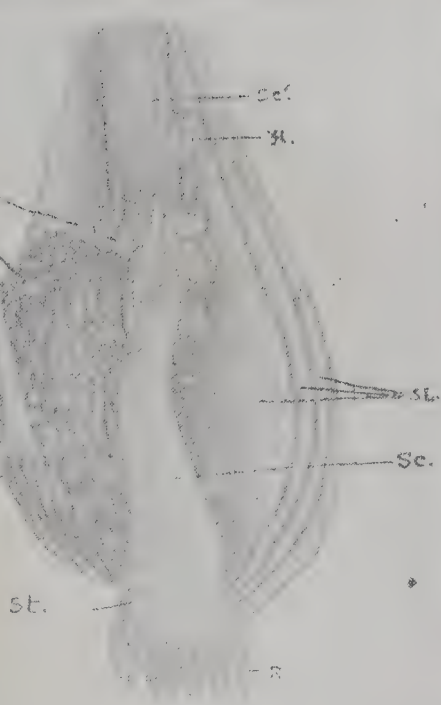


Fig. 2  
(specimen no. 1)  
NAT. SIZE.

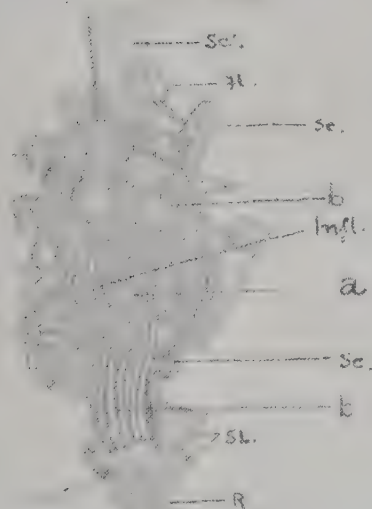


Fig. 3  
(specimen no. 2)  
NAT. SIZE.

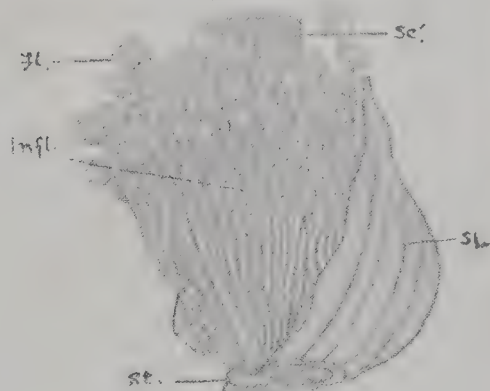


Fig. 4  
(specimen no. 3)  
NAT. SIZE.

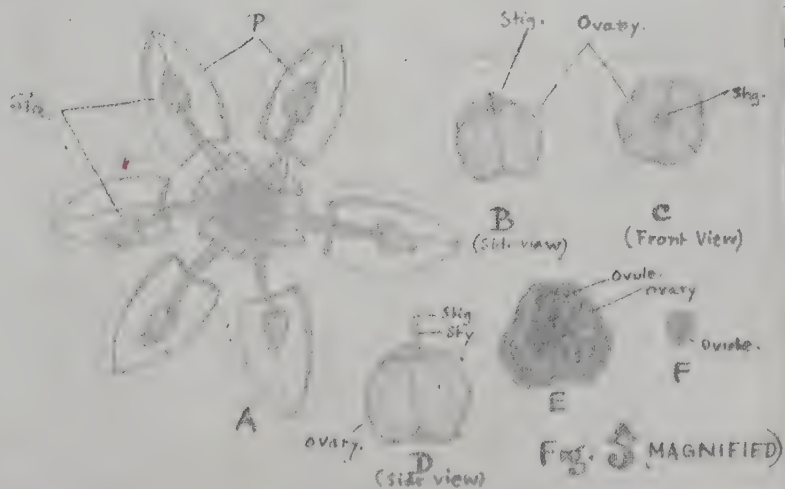


Fig. 5. MAGNIFIED

*Allium Cepa* L.  
Det. F. B. D.

ABORTIVE INFLORESCENCES OF  
*ALLIUM CEPA* L.





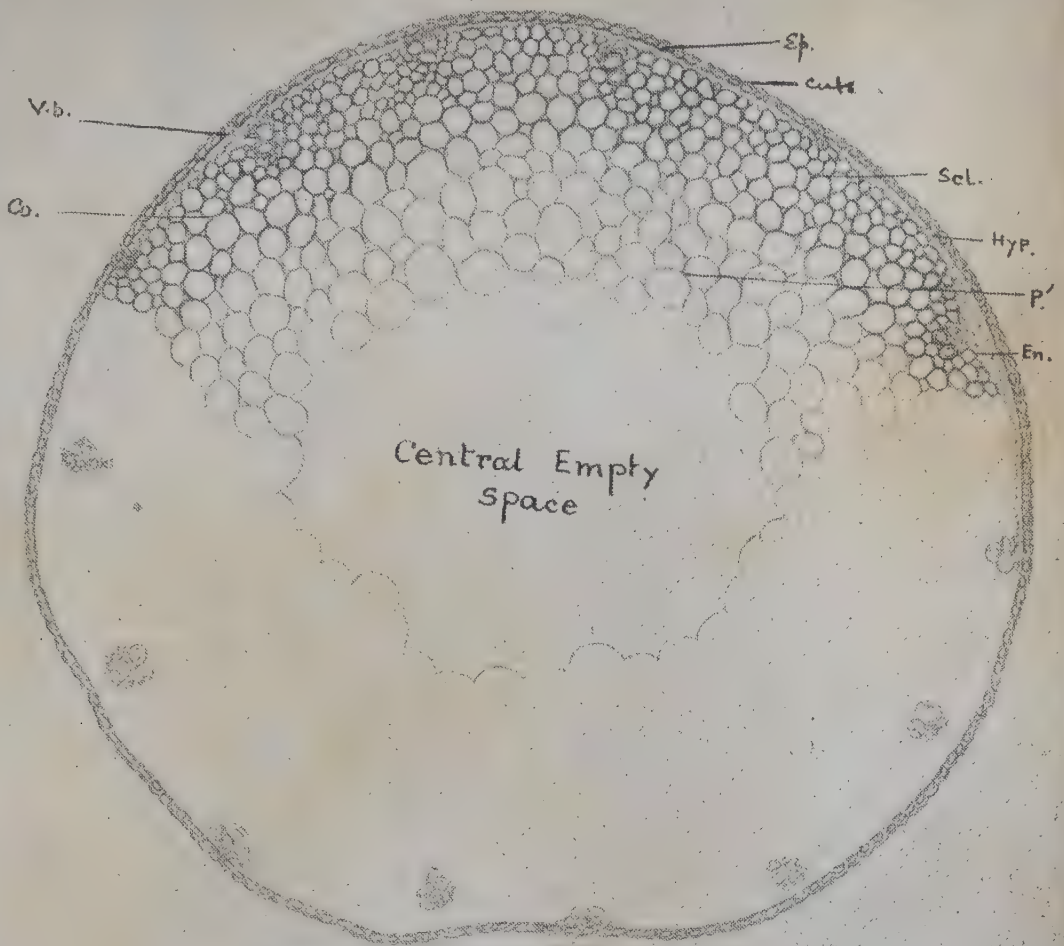


Fig. 6  
Transverse Section of a normal Scape.  
(x nearly 35)

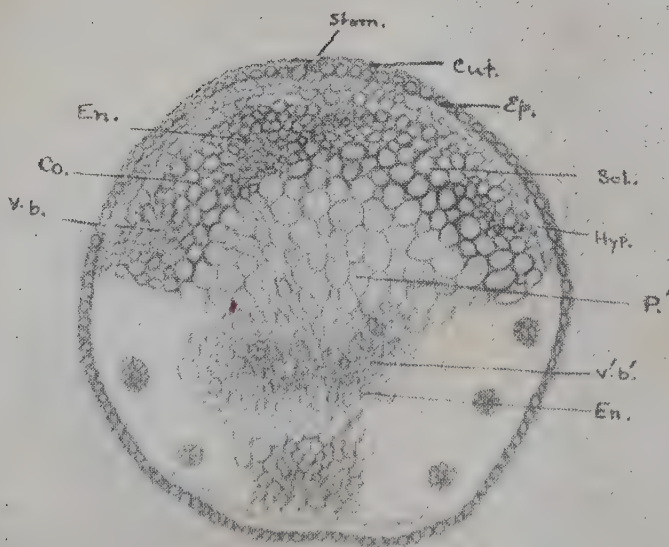


Fig. 7  
Transverse Section of an abortive Scape (x nearly 35)

A. Cepa L.

D. P. M. D.





5. A transition from relatively large rounded to small elongated cells was distinctly noticeable in the pith (P.) in the section of the abortive scape (Fig. 7), whereas in the normal scape (Fig. 6), the cells of the innermost part were distinctly rounded and generally big.

It will be worth while to consider the causes which have contributed to check the growth of the inflorescences in these specimens. It is quite obvious that, as the bulbs were never planted out on soil and as these could not derive any nourishment from any extraneous source, these had to suffer ultimately from starvation. For the supply of the plastic materials necessary for the development of the scapes, flowers and ovules etc., for the continuation and preservation of the stock, the bulbs had to depend solely on the reserve materials stored in the fleshy scale leaves (SL.). These being nothing but limited sources of supply, could serve to provide nourishment only for a limited period of time. Although, stored in a grocer's shop, still, these bulbs were not totally deprived of all those necessary external stimuli, *e.g.*, Light, Heat, Air and Moisture, etc., which serve to stimulate development. These forms of energy, however, were not, in the long run, sufficient for inducing the production of normal development of all the organs. Hence, we find that in specimens Nos. 1 and 2 (Figs. 1—3) abortive scapes were developed and that in specimens Nos. 2 and 3 (Figs. 3 and 4) some or all the flowers were arranged in sessile fascicles instead of in umbels. The reason why the scapes and flowers could not find an opportunity of seeing the light of the day is this, that,—as much of the vigour of these bulbs was spent, without being ultimately recouped, in furthering the development of the inflorescences and scapes (where these were present) the pressure exerted inside the bulbs by these growing organs was not sufficient to overcome the resistance offered by the outer coating of dried scale-leaves. The thickened cuticle on the outer edge, the thicker-walled sclerenchymatous ring in the cortex and the sub-central vascular bundles appear to be nothing but the outcome of an effort, on the part of the poorly nourished growing scapes, to gain an additional strength to withstand the pressure exerted by the shrinking scale-leaves.

My sincere thanks are due to Dr. H. G. Carter, M.B., Ch.B., Economic Botanist in the Botanical Survey of India, for some useful suggestions.

#### *Explanation of Figures.*

Fig. 1.—Specimen No. 1 partially opened to show the abortive inflorescence (Infl.) covered by a membranous covering (Memb.). Natural size.

Fig. 2.—A fuller view of the solid scape (Sc.) and inflorescence (Infl.) in specimen No. 1. Natural size.

Fig. 3.—A portion of the scale leaves (SL.) removed to show the fascicle (c.) arising directly from the stem and the zigzag scape (Sc.) supporting an umbel (a) in specimen No. 2. Natural size.

Fig. 4.—Some of the frontal scale leaves removed to show the fasciculate inflorescence (Infl.) in specimen No. 3. Natural size.

Fig. 5.—A flower from an abortive inflorescence dissected to show the different parts. (A) Front view of a flower without the ovary. (B) Side view of an ovary. (C) Front view of an ovary. (E) Transverse section of an ovary. (F) Ovules. All magnified.

Fig. 6.—Transverse section of a normal scape. Magnified.

Fig. 7.—Transverse section of an abortive scape (Sc.) from specimen No. 2 (See Fig. 3). Magnified.

P. M. DEBBARMAN, B. SC., M.B.A.S.,  
SYSTEMATIC ASSISTANT IN THE  
BOTANICAL SURVEY OF INDIA.



## EDITORIAL.

Members will learn with regret of the retirement of Mr. Millard from the post of Honorary Secretary. Mr. Millard became Joint Honorary Secretary with Mr. Phipson in 1898 and took on the work single handed when the latter retired in 1905, and he remained Honorary Secretary until April 1919 when he retired to England on medical advice. Those who have been brought in contact with him realise the extent of the Society's obligation for the manner in which he has conducted its affairs for the last 20 years. To use his own words "To him it was a labour of love". Unsparingly he devoted his time and energy to the advancement of the Society's interests and we are glad the Journal enables us to record the Society's gratitude.

Although Mr. Millard has retired from India he is continuing to work for the Society, and in England will act as our representative. There is a great amount of work to be done at home in connection with the forthcoming publications of the Society and with the selection and choice and approval of plates. All this Mr. Millard will look after, and he will be in close personal touch with the officials at the Natural History Museum and at the Zoological and Botanical Gardens. Members in England who would like to communicate with Mr. Millard on Society's business should address correspondence to c/o Grindlay and Co., London.

Another loss sustained by the Society has been the resignation of Mr. N. B. Kinnear from his post as Keeper of the Museum and one of the Editors of the Journal. Mr. Kinnear joined us in 1907 and the care of the Museum remained in his hands till October 1919 when he went to England on 6 months' leave. Mr. Kinnear did splendid service for the Society not merely in the Museum but also in the way he encouraged members to collect for us and helped them in their difficulties. During the war Captain Kinnear was Intelligence Staff Officer to the Bombay Brigade but, despite the long hours of work this entailed, all his spare time from military duties was given to the Society. During the periods Mr. Millard was on leave Mr. Kinnear acted as Joint Honorary Secretary, and at these times the Editorial work of the Journal fell mainly on him.

At a Committee meeting held on the 22nd of March 1920 it was resolved that a vote of thanks be passed to Mr. Wroughton for his work on behalf of the Society at the British Museum, particularly in connection with the Mammal Survey.

A similar vote was recorded in favour of Mr. T. B. Fry for his work at the British Museum in keeping the registers and identification lists of the Mammal Survey specimens sent home.

The pages of this Journal have for several years past recorded some of the work done by Mr. Wroughton, but only those actually working in connection with the Society knew the amount of hard, willing, and entirely honorary work these two old members have put in for the Society.

We have recently received a letter expressing the thanks of the Trustees of the British Museum for the donation of several interesting specimens. These included mammals from India, Burma, Persia and Arabia, and among them were the skin of a rare Flying Squirrel (*Eupetaurus cinereus*) from Chitral, a female example of the new form of Blood Pheasant (*Ithagenes kursori*) from near Htawgaw, between the Kachin Hills and China, and 51 small mammals from Persia, collected by Col. J. E. B. Hotson, C.I.E., including the type of a new Bat (*Myotis myotis risorius*).

Members resident in England will be interested to learn that the Committee have decided to open a Banking account in London in the name of the Society, with the National Bank of India there, and to accept subscriptions from members resident in England at two shillings exchange. so that

the annual subscription, including postage on Journals and registration, is £1-15-9 payable in London. Members in England having money transactions with the Society are asked to pay cheques drawn on English Banks into our Bankers at home, and so obviate any loss to the Society through varying exchange.

We would draw the attention of members to the appeal from Mr. E. C. Stuart Baker for information regarding eggs and nesting habits of Partridges, which he requires for his paper on these birds in his serial on Game Birds now current in the Journal. It would be very advantageous if members who have the opportunity for making observations or collecting eggs would communicate with Mr. Stuart Baker. It is on the activities of its members that a Society like ours must chiefly rely. It is due to their efforts that so much has been accomplished in the past and we look to their continued assistance and support in the future.

Butterfly collectors will be interested in Col. C. H. Ward's offer of a collection of Indian butterflies. Col. Ward has been collecting for several years and his collections offer a great opportunity to members interested.

With the view to assist in the ready identification of poisonous snakes, the Society has in course of preparation a chart by means of which poisonous and non-poisonous snakes may be readily distinguished. The use of technicalities has been entirely avoided; the object of the chart being to offer to the layman, by the use of simple diagrams, an easy method by which he may tell whether a snake is poisonous or not. The chart has already been approved by several Provincial Governments for use in their schools and hospitals and dispensaries. For the individual member we are preparing a folding pocket chart which he can carry with him on shikar trips or for use on occasions when information on this point might be of vital importance. For the medical cure of snake bite it is essential that the species of snake should be known. Generally the snake which caused the injury is killed and by means of this chart an easy method of identification will be found. Instances are on record where people have died of fright after being bitten by a perfectly harmless species. Such a chart as this should go far towards spreading knowledge of a subject which is of great importance to people resident in India. We expect to have copies ready by next cold weather; the price will be low and members can register their names for copies now if desired.

Mr. Stuart Baker is preparing a Hand List of the Birds of the Indian Empire which will summarise the extent of our present day knowledge of Indian Avifauna. The list will show the various races, will include the many recently described species, and will give short notes as regards distribution and locality where the types were obtained. The list will be published in our Journal and on completion will be issued separately and ought to be a welcome addition to the library of all those interested in ornithology.

A similar list is being prepared by Col. Wall in connection with the snakes. Both these lists will be useful supplements to the volumes in the Fauna of British India Series which, owing to the advancement of our knowledge in recent years, have in many instances been rendered practically obsolete.

Members who were in Mesopotamia, and those especially who helped with the collection, will be sorry to learn that the Society's entire collection of Mesopotamian Lizards was lost in transit after having been identified at the British Museum. We take this opportunity of appealing to those still stationed in Mesopotamia to remedy the loss by sending us fresh specimens. Specimens should be put into fairly strong spirits of wine and after "pickling" for some time they can be taken out and wrapped in cotton soaked in the spirit, and soldered up in a tin for despatch by post.



The various collections of Birds, Mammals, etc., from Mesopotamia are now all in England where they are being worked out. The lists of identifications will be published in the *Journal* and on completion of the whole Mesopotamian series they will be bound together and be available as a separate publication, and as such will form a handy work on the Fauna of that country.

It is hoped that these editorial notes, which it is proposed to continue, will by giving members a wider knowledge of our affairs and activities increase their keenness and interest, as it is on these that the life and progress of a Society like ours depend.

Capt. J. A. Budden wrote to us from England a short time ago with regard to the *Journal*, and in his letter he says—"I fully understand that your *Journal* is for the scientific advancement of Natural History in India but I make a plea that you cater for the ordinary lover of the jungle. Why not get known reliable members to write popular articles on their shoots and observations, etc., which would be full of interest to many subscribers who are out of touch with the highly scientific side of Natural History. Many Forest Officers—good observers, hunters and writers—would interest us all."

Capt. J. A. Budden's suggestions are excellent and there is no doubt that many of our members could send us very valuable articles which would be of an intensely interesting nature and whilst valuable from the scientific point of view would appeal to the ordinary non-scientific member. Our trouble in the past has been that so few of our members who can write could be encouraged to write. The Miscellaneous Notes at the end of each number offer a means for bringing about the end aimed at, and we appeal to all members who have facilities for making notes and observations on Natural History subjects, either on shikar trips or any occasions when brought in contact with Jungle life, to send in their observations. Help in this direction will tend greatly to popularise the *Journal* and so would be to the advantage and benefit of our Society.

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## PROCEEDINGS

## OF A MEETING HELD ON 22ND JANUARY 1920.

A meeting of members and their friends took place on Thursday, the 22nd January, Colonel C. H. Ward presiding.

The election of the following 53 new members since the last meeting was announced :—Mr. Bjarne Hagen, Bombay ; Mr. E. Chapple, Bankok ; Mr. George Brown, Ceylon ; Capt. A. B. Gibson, Bombay ; Lt.-Col. M. Henderson, Quetta ; Capt. R. G. Bignell, Aden ; Mr. R. W. D. Willoughby, I.C.S., Kheri, Oudh ; Mr. H. R. Cox, Simla ; Lt.-Col. H. Brooke Smith, D.S.O., R.F.A., Bombay ; the Mess President, Officers' Mess, King's Own Yorkshire Lt. Infy., Mhow, C. I. ; Lt. W. H. C. Jones, Belgaum ; Major E. H. B. Stanley, I.M.S., Lahore Cantonment ; Major G. Petit, R.A.M.C., Bombay ; Major P. B. Arbuthnot, I.A., Secunderabad ; Mr. A. R. Ubsdell, Calcutta ; Lt. A. P. Beatty, Jullunder ; Lt. R. E. Boothby, Meerut, U. P. ; Capt. W. R. Ward, O.B.E., Bombay ; Sir Lakhajiraj, K.C.I.E., Rajkot ; Mr. G. S. Napier-Ford, Vandiperiyar ; Mr. Malik Sahim Abdul Haq, Jullunder ; Capt. E. C. Sylvester, R.F.A., Vandiperiyar ; Miss L. D. Greene, M.A., Lahore ; Mr. C. F. Cunningham, Bombay ; Mr. C. S. Chaston, Topolia, P. O. ; Lt.-Col. A. W. N. Bowen, R.A. M.C., Ahmednagar ; Mr. K. B. Mazagonwalla, B.A., Bombay ; Mr. H. F. Lodge, Bombay ; Mr. C. F. C. Steward, Mirik, P. O. ; Major Sidney Smith, R.G.A., Karachi ; Mr. Chas. F. Morris, Bombay ; Mr. A. N. Campbell, Bombay ; Dr. R. N. O'Moynan, Bilaspur, C. P. ; Mr. L. E. Aspinall, Rangoon ; Mr. E. C. Dowson, Ceylon ; Lt. J. G. Miller, Kandri ; the Librarian, Bureau of Science, Manila, P. I. ; Mr. W. G. Beagle-Atkins, Sadiva ; Brig.-Genl. A. C. Wauchope, Mesopotamia ; Major D. G. Oliver, Bombay ; Thakur Rameshwar Singh of Bandanwara, Ajmer ; Mr. E. E. G. L. Searight, Bombay ; Mr. E. G. Browne, Fatehgarh, U. P. ; Mr. P. G. Gilliam, Bagdogra, P. O. ; Mr. T. E. T. Upton, Calcutta ; Mr. J. J. Macpherson, Jalpaiguri ; Mr. R. C. Lowndes, Bombay ; Mr. C. Dover, Calcutta ; Mr. C. M. Harlow, I.F.S., Calcutta ; Mr. Allan Mackenzie, Bengal ; Mr. W. H. Woodhouse-Adolphus, Coimbatore ; Capt. H. Bullock, I.A., Salonica ; and Major H. R. P. Dickson, C.I.E., Bahrain.

The following contributions to the Museum were received since the last meeting :—

Contribution.	Locality.	Donor.
76 Mammal skins and skulls ..	M o g o k c h u n g , Assam.	Mr. J. P. Mills.
213 Mammals .. .. .	Shiraz, Persia ..	Lt.-Col. J. E. B. Hotson.
10 Birds .. .. .		
Botanical specimens ..		
3 Urial skins ( <i>Ovis vignei</i> ) ..		
5 Marmots ( <i>Arctomys sp.</i> ) ..	Ladak and Tibet .	Mr. F. Ludlow.
1 Pale Weasel ( <i>P. alpinus</i> ) ..		
1 Mouse Hare ( <i>Lagomys sp.</i> )..		
9 Birds skins .. .. .		
2 Indian Gerbilles ( <i>G. indica</i> )	Montgomery, Pun- jab.	Mr. W. A. Phillips.
1 Hare ( <i>Lepus sp.</i> ) .. .. .		
1 Jackal ( <i>C. indicus</i> ) .. ..		



Contribution.	Locality.	Donor.
2 Chinkara skulls ( <i>Gazella benetti</i> ).	Cutch .. ..	H. H. The Rao of Cutch.
12 Mammals .. .. }	Ceylon .. ..	M. J. W. B. Goodfellow.
1 Bird skin .. .. }		
6 Blackbuck ( <i>A. cervicapra</i> ) ..	Dhar, C. I. ..	H. H. The Maharaja of Dhar.
1 Hamster ( <i>Cricetulus sp.</i> ) ..	Menjil, N. Persia.	Capt. C. M. Ingoldby
1 Fox ( <i>Vulpes sp.</i> ) .. ..	Mesopotamia ..	Lt. W. H. O. Shortt.
1 Little Malay Chevrotain ( <i>Tragulus k. rarus</i> ).	Tavoy .. ..	Mr. C. Hopwood.
1 Pine Marten ( <i>M. flavigula</i> ). }	Simla .. ..	Mr. A. E. Jones.
2 Weasels ( <i>Mustela canigula</i> ) }		
1 Bat ( <i>Pepistrellus sp.</i> ) .. }		
22 Mammals, 2 Birds and 3 nests with eggs.	Imaw Bum Range N. Burma.	Mr. F. Kington Ward.
1 Wild Dog ( <i>C. dukhunensis</i> ) ..	Hasimara, Bhutan Duars.	Mr. H. V. O'Donel.
1 Hamster ( <i>Cricetulus sp.</i> ) ..	Kasin, N. Persia.	Capt. P. A. Buxton.
1 Pigmy Shrew ( <i>Pachyura sp.</i> ).	Mesopotamia ..	Capt. E. A. Glennie.
1 Pale Hedgehog (alive) ( <i>Erinaceus micropus</i> ).	Baroda .. ..	Dr. R. N. Jadav.
1 Bat ( <i>Myotis sp.</i> ) in al. ..	Darjeeling ..	Mr. O. Lindgren.
1 Coronetted Sandgrouse } <i>P. coronatus</i> .	Punjab, Sind and Baluchistan.	Capt. C. Ticehurst.
1 Turnstone ( <i>S. interpes</i> ) .. }		
12 Small Mammals .. .. }	Mesopotamia and the Punjab.	Major F. E. W. Venning.
23 Birds' skins .. .. }		
1 Wood Snipe ( <i>G. nemoricola</i> ).	Chapra .. ..	G. J. Monahern.
28 Birds' eggs .. ..	Museyeh, Mesopotamia.	Capt. C. R. Pitman.
1 Pale Harrier ( <i>C. cyaneus</i> ) ..	Do. .. ..	Capt. T. R. Livesey.
2 Birds .. ..	Basra .. ..	Major W. M. Logan Home.
1 Wood Snipe ( <i>G. nemoricola</i> ) ..	Imphal, Manipur.	Mr. C. Gimson.
1 Short-toed eagle ( <i>C. gallicus</i> ).	Thana, Bombay..	Mr. W. R. Clarke.
2 Goosander ( <i>M. castor</i> ) .. ..	Garhwal .. ..	Capt. A. S. Brooke
1 Black-barred Cat Snake ( <i>D. cynodon</i> ).	Tura, Assam ..	Dr. J. Ahlquist.
9 Snakes .. ..	Do. .. ..	Mrs. Jackson.
1 Banded Coral Snake ( <i>C. maclellandi</i> ).	Maymyo, Burma.	Lt. B. H. Hayes.
1 Snake ( <i>Aspidura trachyprocta</i> ).	Haputale, Ceylon.	Mr. James Erskine.
2 Shrimps and 1 Fish .. ..	Madras .. ..	Mr. Rodgers.
1 Scorpion and a few insects, etc.	Mesopotamia ..	Lt.-Col. H. D. Peile, I.M.S.

Minor contributions from:— Capt. H. R. Rishworth, Mr. C. Beeson, J. Erskine, H. French, Mrs. Jackson, Lt.-Col. Tupe, O. C. Ollenback, Major Kunhardt, R. E. Haslam, Col. A. B. Dew, O. Lindgren, Capt. F. B. Scott, Lt.-Col. A. W. Bowen, Mrs. Cocke, W. R. Clarke, T. H. Cameron, J. Makeig Jones, Mr. Ackworth and Mr. Baretto.

#### CONTRIBUTIONS TO MUSEUM.

The Society has to acknowledge a large number of contributions received since the last meeting. Our thanks are due to Col. J. E. B. Hotson for his continued efforts on our behalf, his recent collections from Baluchistan have been of great scientific value, several new forms and species having been discovered. The Society has since received from him a further consignment of 213 mammals, several birds and pressed plants obtained around Shiraz in Southern Persia.

#### EXHIBITS FROM MESOPOTAMIA.

Since demobilization the number of contributions from Mesopotamia, &c., has dwindled down, but the Society still continues to receive some specimens. Among these are 28 bird skins from Major W. M. Logan Home and 23 from Major F. E. W. Venning (the latter number including a few skins from the Punjab). Several birds' eggs were presented by Capt. C. R. S. Pitman and a Pale Harrier from the banks of the Euphrates by Capt. T. R. Livesey; Lt. W. H. O. Shortt sent a fox from Baghdad and Capt. Glennie, a Pigmy Shrew. A Scorpion and a few insects were contributed by Lt.-Col. H. D. Peile, I.M.S. The Society has received a number of skins of that curious rodent the Grey Hamster (*Cricetulus*). The Hamsters are Palearctic and yet have been recognised as practically identical with a genus found in North America, formerly described under the name *Hesperomys*. A large series of these were received from Col. Hotson and specimens have also been collected for us by Capt. P. A. Buxton, R.A.M.C., Capt. C. M. Ingoldby, R.A.M.C., and Capt. C. B. Tichurst, R.A.M.C., from Persia and Baluchistan.

#### EXHIBITS FROM INDIA, BURMA AND CEYLON.

The most outstanding feature of our contributions from within Indian limits is a collection of skins from Mr. J. P. Mills, I.C.S., Mokokchung, Assam. Mr. Mills' collection includes examples of the White-handed Gibbon, Small-toothed Palm-Civet, Ferret-Badger, various Tree Shrews and Bamboo Rats. Another valuable collection is that obtained for us by Lieut. Kingdon Ward in the Imaw Bum Range on the Burmo-Yunnan frontier. Among the specimens sent are examples of Anderson's Squirrel, several Brown-toothed Shrews, Pere David's Vole, a Weasel and Bamboo Rats. A Chinese Blood-Pheasant and a Laughing-Thrush were also collected by him in the same locality. The collection is a useful supplement to the work of the Mammal Survey in Burma. The Society records its obligations to Mr. F. Ludlow for a series of Marmot skins collected by him in Tibet. These animals have been for a long time very greatly needed for the proper working out of this genus, of which practically little is known scientifically. Mr. Ludlow also presented us with the skins of 3 Oorials, 3 Hares and a Pale Weasel. Twelve mammal skins from Ceylon were received from Mr. G. W. B. Goodfellow. Mr. C. Hopwood, I.F.S., contributed a Malay Chevrotain from Tavoy and Mr. A. E. Jones a Pine Marten, two Weasels and a Bat from the Simla Hills. Six Blackbuck heads and skins were received from H. H. the Maharaja of Dhar. His Highness has already sent a number of these skins and has



kindly promised to continue to send specimens shot at different periods of the year with a view to ascertaining any seasonal colour variation in these animals.

Amongst various additions to our bird collection are two very fine examples of the Goosander by Capt. A. S. Brooke, Gharwal. Contributions to our collection of Reptilia include 9 snakes from Mrs. Jackson and a Black-barred Cat Snake from Dr. Ahlquist, Tura, Assam ; a Diamond-backed Rat Snake from Peshawar from Mr. Makeig-Jones ; a Banded Coral Snake from Lt. B. H. Hayes, Maymyo ; and 9 frogs from Mr. F. J. Mitchell, Srinagar, Kashmir.

Prof. F. Hallberg read some Notes, illustrated with photographs, on the plants of North Canara.

A vote of thanks was passed to Professor Hallberg for his interesting paper and for the excellent photographs exhibited by him.

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## PROCEEDINGS.

OF THE MEETING HELD ON 26TH FEBRUARY 1920.

## ANNUAL MEETING.

A meeting of members and their friends took place on Thursday, the 26th February 1920, the Hon. Sir George Carmichael, K.C.S.I., presiding.

The election of the following 24 new members since the last meeting was announced:—The Director of Agriculture, Gwalior Government, Gwalior, C.I.; Mr. H. R. Cooper, B.Sc., F.C.S., Assam; Mr. J. M. Wilson, Badlipar, Assam; Mr. R. F. Stephen, Badlipar, Assam; Mr. F. A. Hill, Badlipar, Assam; Mr. R. Stanley, Badlipar, Assam; Mr. J. J. Perry, Tavoy; Mr. Manek M. Manekji, Tavoy; Mr. H. Brian C. Hill, Chabua, Upper Assam; Lieut. S.G. Butler, I.A.R.O., Calcutta; Captain H. M. Stanford, R.F.A., M.B.O.U., Mesopotamia; Mr. Raymond W. d'Adhemar, Delhi; Mr. M. C. Mc. Leod, Calcutta; Mr. J. G. Brooker, Mirpurkhas; Mrs. W. Ouseley, Dhukrani; Mr. J. Ribeiro, L.C.E., Bombay; Mr. Wm. Theobald, Mysore; Mr. G. L. Shaw, Banarhat, Jalpaiguri; the Honorary Secretary, Club of Western India, Poona; and Colonel H. N. Dunn, A.M.S., Bangalore.

The following gentlemen were elected as office-bearers for the present year: President,—H. E. the Right Hon'ble Sir George Lloyd, G.C.I.E., D.S.O.; Vice-Presidents—Mr. J. D. Inverarity, B.A., LL.B.; the Hon. Sir Norman Macleod, and H. H. the Maharao of Cutch, G.C.S.I., G.C.I.E.

Managing Committee:—Mr. T. Bainbrigge Fletcher, F.E.S., Mr. T. R. Bell, C.I.E., Rev. E. Blatter, S.J., Mr. E. Comber, F.Z.S., Colonel G. H. Evans, C.I.E., F.L.S., Lieut-Col. W. H. Evans, R.E., Major M. L. Ferrar, I.A., C.B.E., Major F. C. Fraser, I.M.S., M.D., Lieut-Col. J. E. B. Hotson, I.A.R.O., C.B.E. (I.C.S.), Mr. C. M. Inglis, Professor V. N. Hate, Lieut.-Col. W. Glen Liston, C.I.E., I.M.S., Mr. F. M. Mackwood, the Hon. Mr. P. J. Mead, C.I.E., I.C.S., Mr. H. P. Macnaghten, B.A., Mr. R. A. Spence, Lieut.-Col. F. Wall, I.M.S., C.M.G., C.M.Z.S., Lieut.-Col. H. J. Walton, I.M.S., C.M.Z.S., and Mr. John Wallace, C.E.

Mr. H. F. Lodge, Honorary Treasurer and Mr. W. S. Millard, Honorary Secretary.

The following contributions to the Museum were received since the last meeting:—

Contribution.	Locality.	Donor.
Wild dog pup ( <i>Cuon dukhunensis</i> )	Gonda, U. P. ..	Mr. F. Field.
4 Blackbuck skins with horns ( <i>A. cervicapra</i> ).	Dhar, C. I. ..	H. H. The Maharaja of Dhar.
8 Mammals .. ..	Naga Hills, Assam.	Mr. J. P. Mills.
1 Himalayan Black Bear ( <i>Ursus himalayanus</i> ).	Manipur ..	Col. G. W. Row.
2 Desert Foxes ( <i>Vulpus sp.</i> )	N. Baghdad ..	Lt. W. H. O. Shortt.
1 Jungle Cat ( <i>Felis sp.</i> ) ..		
1 Crested Pochard ( <i>Nyroca rufina</i> ).		
1 White-eyed Duck ( <i>N. fuligula</i> ).	20 miles from Babylon.	General Wauchope.



Contribution.	Locality.	Donor.
2 Hobbys ( <i>Falco subuteo</i> ) ..	Pegu .. ..	Mr. S. E. F. Jenkins.
2 Arabian Chukor ( <i>C. melan- ocephala</i> .)	Aden, Arabia ..	Capt. R. G. Bignel.
1 <i>Echis coloratus</i> (Arabian Saw- scaled Viper).	Aden .. ..	Do.
Skull of a Grampus ( <i>Orca sp.</i> ) ..	Bushire .. ..	Major F. C. Fraser, I.M.S.
1 Scorpion .. .. .	Rangoon ..	Dr. H. H. Marshall.
1 Centipede .. .. .		
2 Spiders .. .. .		
234 Mammals .. .. .	Assam .. ..	Mr. H. W. Wells.
15 Birds .. .. .		
1 <i>Rattus. r. rufescens</i> .. .. .	Southern India ..	Mr. A. F. Martin.
1 <i>Golunda ellioti</i> .. .. .		
1 <i>Zamenis diadema</i> (Diamond- backed Rat Snake).	Mesopotamia ..	Lt. W. H. O. Shortt.

## ACCOUNTS FOR 1919.

Mr. H. F. Lodge, the Honorary Treasurer, in presenting the accounts for the year ended 31st December 1919, said that a copy of the audited balance sheet was on the table for the inspection of members and this would as usual be published in the Society's journal. The following, however, were the main features of the accounts of the past year. On 1st January 1919, the Society opened with a credit balance of Rs. 14,727-5-8 and during the year this figure was increased to Rs. 15,168-12-11, the cash balance shown on the 31st December 1919. The receipts during the year under review amounted to Rs. 33,767-4-8 which shows a decrease of Rs. 2,203, when compared with the corresponding figures of the previous year. The expenditure during the year 1919 amounted to Rs. 34,196-14-8 and this figure shows an increase of Rs. 9,719-10-11 over the corresponding figures for 1918.

The increase in expenditure was easily understood as the Society in common with every other institution had lately had to pay considerable more for every thing required to carry on its work. In spite of this the Society had not increased the annual subscription which remains at Rs. 15 and it was hoped to avoid having to do so. Indications for 1920 pointed to the fact that expenditure generally would be still further increased and to counteract the rise in prices every effort ought to be made to increase the revenues of the Society and this can best be done by the enrolment of new members. It is therefore hoped that members would do their best to interest their friends who were not already members in the work of the Society with a view to their being enrolled as members.

Since the close of the year ended 31st December 1918, 125 members had joined the Society and 52 had resigned or died, making a net increase of 73 to the membership of the Society which now totalled 1,821. During the year 1918 the membership of the Society had been increased by 84. The slight decrease in the number of new members during 1919 must not be taken as an indication that the Society was losing its popularity. The Society was full of vitality and its members were to be found in all parts of India, Burma and Ceylon. Now that we had come to the end of the first year of

peace and the process of settling back again into peace-time conditions was well under weigh, it was hoped that the year 1920 would show a marked increase in the Society's general prosperity both as regards new members and cash balances.

As regards the Mammal Fund, the balance at the commencement of the year was Rs. 8,684-7-2 and the closing balance Rs. 12,389-2-5. During the year under review the Mammal Survey was dormant till October 1919 except in Baluchistan where Lieut.-Col. Hotson at his own expense defrayed half the charges of Mr. Baptista to carry on the Survey work in that area and very valuable work was done. Col. Hotson is now continuing the work with the same assistance in S. Persia. As soon as it was discovered that neither the services of Messrs. Shortridge nor Crump, who were in charge of the Survey before the war, were again available Mr. Wells was brought out from England and proceeded straight to Assam. We have only just received his first collection of specimens. If funds will permit, it is proposed to engage another Collector in order that this very valuable survey may be the more quickly completed.

### CONTRIBUTIONS.

As regards contributions received for the Museum since the last meeting :—

Two foxes and a jungle cat were presented by Capt. W. H. O. Shortt from Baghdad, Mr. J. P. Mills, I.C.S., sent in a further lot of Mammal skins from Assam, these include bamboo rats, flying squirrels, water shrews, a marten, and a wild dog. A black bear skin and skull was received from Lieut.-Col. G. W. Row, Manipur, Assam. The Society has obtained a few bears' skins, from the Assam Hill Ranges. These have proved of great interest and it is intended to have them examined and worked out at the British Museum, so as to establish the identity of the various species found in those hills. 4 black bucks' skins and skulls were presented by H. H. the Maharaja of Dhar. Two very fine examples of the Arabian chukor (*C. melanocephala*) were sent to us from the neighbourhood of Aden, by Captain R. Bignell. This species is the largest of the chukor partridges and is a remarkably handsome bird. An Arabian saw-scaled viper was also received from him. Two Indian Hobbys were presented by S. E. F. Jenkins, Pegu, and Major F. C. Fraser, I.M.S., contributed a perfectly preserved skull of a grampus from Bushire.

### MAMMAL SURVEY.

The first consignment of specimens since the restarting of the Mammal Survey, which was in abeyance during the war, has just been received from Mr. H. W. Wells, the Society's Collector. Mr. Wells commenced work in October last, starting at Margherita in Assam; he collected for some time along the Assam-Burmese border but found the jungle very thick and heavy; he is now at Tura in the Garo Hills. The collection just unpacked consists of some 234 species and is extremely interesting. It includes some remarkable monkeys and a fine series of shrews. The collection will shortly be sent to the British Museum (Natural History) for identification and return. Vast tracts of Assam present practically a virgin field to the Zoological Collector and the work of the Mammal Survey will, it is hoped, be productive of some remarkable additions to our knowledge of the fauna of that interesting region.

The Society is anxious to bring out a second collector and so complete the Survey more quickly if only sufficient funds can be obtained.



## THE GEOLOGY OF WORLI HILL.

Mr. Ribeiro read a very interesting paper on the above subject and illustrated it with several very fine examples of various minerals and fossils collected by him at Worli.

He said Worli Hill at no distant date formed by itself one of the seven isles which go to make up our present City of Bombay. It is a very interesting spot geologically, in fact the most interesting in Bombay. The Hill is made up of two lava flows, between which is sandwiched a 30-feet thick bed of sedimentary deposits. The lava beds are similar to the trap rock in the other parts of the island, but the aqueous strata contain a large amount of interesting relics from which important facts can be deduced.

An examination of the beds of trap above and below the sedimentary rock shows that the latter is older than both the trap flows, and the occurrence of a very large amount of frog fossils goes to prove that the aqueous deposits took place under fresh water, probably in a lake or a river.

Mr. Ribeiro said that he had secured a fine collection of rock, mineral and fossil specimens from the Hill, but it was very much to be regretted that owing to the non-existence in a City like Bombay of a standard collection of minerals and geological specimens, it is not possible to give the specific names of them beyond saving that they consist of Calcite quartz and Zeolites.

The full text of Mr. Ribeiro's paper will be published in the Society's Journal.

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## THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.,

PART XXX.

*With a Coloured Plate.*

*(Continued from page 24 of this Volume.)*

Genus—*FRANCOLINUS*.

The genus *Francolinus* contains a very large group of African, European and Asiatic Game-birds which in general appearance are very like the true Partridges (*Perdix*) but have 14 tail feathers instead of 16 or 18. The legs also are longer and stouter and, in the males, are generally furnished with a spur.

The wing is longer than the tail, but is short and rounded. The third or fourth primary is longest, and the fifth and sixth almost as long. In some species the sexes are alike, in other dissimilar.

Only five species of Francolin are known in India, but three of these are further divided into two or three geographical races, many of which Hartert has recently discussed at length in *Novitates Zoologicæ*.

### KEY TO SPECIES AND SUB-SPECIES.

A. Quills transversely barred or spotted with buff on both webs.

a. Scapulars with a conspicuous buff submarginal band.

a'. Males with chestnut collar and females with chestnut nuchal patch.

a". Darker .. .. *F. f. asiæ*.

b". Much paler .. .. *F. f. henrici*.

c". Darkest, much black  
above and below .. *F. f. melanonotus*.



- b'*. No chestnut collar or patch.  
*d''*. Darker . . . . . *F. p. pictus*.  
*e''*. Paler . . . . . *F. p. pallidus*.  
*b*. No submarginal buff band on scapulars *F. chinensis*.  
 B. Quills without transverse bars or spots.  
*c*. Breast buff with narrow black cross-bars.  
*c'*. Darker, centre of throat ochraceous . . . . . *F. p. pondicerianus*.  
*d'*. Paler, centre of throat creamy white . . . . . *F. p. interpositus*.  
*e'*. Palest, more grey and less chestnut . . . . . *F. p. mecranensis*.  
*d*. Breast brown, with broad longitudinal white stripes . . . . . *F. gularis*.

In giving the synonymy of the various races I have as far as possible worked them out geographically, but in many cases the areas and countries referred to overlap, whilst in some no definite locality is given. References to forms which do not occur within the limits of the Indian Empire have not been given.

#### FRANCOLINUS FRANCOLINUS ASIÆ.

##### *The Northern Indian Black Partridge.*

*Francolinus asiæ*.—Bonap., Compt. Rendu. XLII., p. 882 (1856) (Asia), Bree., Ibis, 1863, p. 115.

*Francolinus orientalis europæus*.—Buturlin., Orn. Monatsb., p. 81 (1907) (?) (Greece).

*Tetrao francolinus*.—Linn. Syst. Nat. I., p. 275 (1766); Gmelin, Syst. Nat. I., (2), p. 756 (1788) (S. Asia).

*Perdix francolinus*.—Lath. Ind. Orn. II., p. 644 (1790) (Europe, Africa, Asia); Temm. Pig. et Gal. III., p. 340 (1815) (part); Vieill. Tabl. Ency. Meth. I., p. 214 (1823); Jard. Nat. Lib. Orn. IV., p. 110 (1834) (part).

*Francolinus vulgaris*.—Blyth, Cat. B. Mus. Asiat. Soc. p. 251, (1849) (N. India, Persia, etc.); Adams, P. Z. S., 1858, p. 502 (Bombay, Bengal, etc.); id, ibid, 1859, p. 186; Irby, Ibis, 1861 p. 236 (Oudh. and Kumaon); Jerd. B. of I. III., p. 558, (1864); Tytler, Ibis, 1868, p. 203, (Simla to Mussoorie); Pelz., Ibis, 1868, p. 383, (Koteghur); Hume, N. & E. In. Birds, p. 537 (1873); Ball, Str. Feath. II., p. 427 (1874) (Chota Nagpore); Butler, ibid, IV., p. 5, (1876) (Deesa); Ball, ibid, VII., p. 225, (1878) (Ganges to Godaveri); Hume and Mars. Game-birds, II., p. 9 (1879); Reid, Str. Feath., X., p. 62 (1881) (Lucknow); Marshall, Ibis, 1884, p. 423 (Chamba); Taylor, Str. Feath, X., p. 530 (1881); St. John, Ibis, 1889, p. 175 (Afghanistan); Oates, ed. Hume's N. & Eggs III., p. 428 (1890); Blanf. Fauna B. I. IV., p. 136 (1898); Jesse, Ibis, 1901, p. 604 (Lucknow); id, ibid, 1902, p. 475 (Fyzabad); Inglis, Jour. B. N. H. S., XIV., p. 563 (1902) (Behar); Jesse, Ibis, 1903, p. 153 (Gogra-Ganges); Whympers, Jour. B. N. H. S., XVII., p. 232 (1906) (Naini-Tal); Ward, ibid, p. 944 (1907), (Jhelum); King, Jour. B. N. H. S., XXI., p. 100 (1911) (Saugor); Osmaston, ibid, XXII., p. 544, (1913) (Gorukpur); Brooking, ibid, XXVI., p. 677 (1919) (Euphrates Valley).

*Francolinus francolinus*.—Ogilvie-Grant, Cat. B. M. XXII., p. 132 (1893).

*Francolinus francolinus asiæ*.—Hartert, Nov. Zool. XXIV., p. 288 (1917).

VERNACULAR NAMES.—Tetra Kalo-tetra (*Garhwal*); Kala-titar (*Hin.*)

*Description—Adult Male.*—Crown to nape sandy or rufous brown, the feathers centred dark brown, supercilium and feathers round the eye black; a broad white band from lower lores, cheeks and ear-coverts white; chin, throat and broad patch below ear-coverts running up to nape black; feathers of nape showing a little black and white mottling. A broad chestnut collar all round the neck; behind the collar the back and sides are black, each feather with white spots on either web; back, scapulars and smaller wing-coverts, and innermost secondaries brown, each feather with a sub-marginal black-edged band of buff or sandy rufous, the transition from the black upper back being very gradual and not abrupt. Lower back, rump, upper tail-coverts and tail feathers black with narrow white or fulvous-white bars, the outer tail feathers with the terminal third unbarred black. Primaries, outer secondaries and greater coverts, dark brown with spots or broken bars of rufous buff.

Below, the breast is black, unspotted in very old males in the centre, but with oval white spots on the sides; flanks black with larger, longer, oval, white spots, rarely running to longitudinal bars on the posterior flanks and generally with narrow brown fringes; lower breast and thigh-coverts black to blackish brown with very large white spots or bars; centre of abdomen and vent light chestnut with whitish bars, under tail-coverts chestnut, rarely having a few bars of white or fulvous.

Under wing-coverts and axillaries mottled fulvous and dark brown.

*Colours of Soft Parts.*—Irides hazel-brown to dark brown; bill black or dark horny brown, the tip of the lower mandible whitish; legs and feet reddish brown to orange red or brick red, always brighter and redder during the breeding season than at other times; claws black or horny brown; spur dark horny, often paler at the tip.

*Measurements.*—Length about 13 inches (330mm.); wing 145·5 to 168 mm.; average 80 birds, 155·3 mm.; tail 77 to 110 mm.; tarsus about 45 to 50 mm.; bill at front about 24 mm., and from gape 27 mm.

Birds from various districts vary greatly in size. Thus 41 birds from Gurgaon average under 153, whilst others from Kumaon and Simla average in wing measurement a full 158 mm.; Deccan birds are very small.

“Weight 10 to 20-ozs.” (Hume).

Hume remarks on the weight “I have shot males in good condition in Gurgaon scrub weighing only 10-ozs. and others in the Kadar of the Ganges, in the Marut district, weighing fully 20-ozs.”

In addition to being smaller, birds from Gurgaon and the Plains generally have darker heads than those from the hills and the white and black mottling of the neck seems to extend further down the back.



*Adult Female*.—Above similar to the male, but paler and duller ; the black and white cheeks and supercilia are replaced by dull, pale buff ; the ear-coverts are brown or buffy brown, and the cheeks are more or less speckled with dark brown. The chestnut collar is replaced by a duller chestnut nuchal patch, sometimes freckled or slightly barred with brown. Rump, upper tail-coverts and central tail feathers dull pale brown, with narrow wavy bars of pale buff edged with black ; outer tail feathers as in the male.

Below, chin, throat and foreneck white or buffy-white ; breast and flanks white or pale buff, sometimes with a rufescent tinge, with wavy arrow-shaped bars of black, narrowest on the neck and upper breast, and gradually becoming broader on the posterior flanks and lower breast, but again fewer and more narrow on the abdomen where they occasionally disappear altogether. Ventral region pale dull chestnut, sometimes with faint brown bars and sometimes with whitish tips, under tail-coverts chestnut.

*Colours of Soft Parts*.—As in the male, but the legs never become a bright brick-red or orange-red as do those of the male in the breeding season. The bill is paler, more a horny-brown, than black, and the base and gonys is paler still.

*Measurements*.—Length about 12 inches (300 mm.) or rather more ; wing from 138 (one specimen, Gurgaon) and 144 to 167 mm. ; average 149.9 mm. Tarsus and bill a little smaller than in the male, and the former only very rarely with a spur, though there is often a tiny knot to indicate the place where it should grow.

“Weight 8 to 17-ozs.” (Hume).

*Young Males* are like richly-coloured females, but with dark, almost black supercilia and white cheeks, the rufous nuchal patch is darker and more pronounced and the breast is black, though the two white spots take up practically the whole visible portion of each feather.

The black throat and foreneck is soon assumed, but the chin remains white for some time longer.

*Chick in first Plumage* is a peculiarly lark-like little bird, pale rufous buff everywhere with broad dark brown bars and spots. Below the buff is paler, almost albescent, and the spots are smaller.

*Chick in Down*.—Head bright rufous with darker crown and with paler supercilia and cheeks and dark line through the eyes, above brown with a very pale buff streak on either side of the back and rump ; chin whitish, neck and throat fulvous-white, and rest of body below dull earthy white.

At a slightly older stage when the wing quills grow, the brown of the crown seems to become more defined and darker as well as greater in extent.

*Distribution*.—Excluding Sind and the extreme N. W. Frontier of India, the whole of Northern India as far East as W. Nepal in the Hills and East to and including Behar, but not B ngal and Orissa. Birds from these two provinces and also from E. Nepal are somewhat intermediate between *asiac* and *melanonotus*, but are nearer the latter, and I agree with Hartert in retaining them with this race.

Southwards it extends to Deesa, Gwalior, Sambalpur, the Central Provinces to Saran, Parguga and Udaipur and Western Bengal to Chota Nagpore.

*Type Locality*.—Asia. To restrict this further, I now designate Gurgaon, India, as the type locality for this race.

*Nidification*.—The Indian Black Partridge breeds principally in May and June and early July, but the breeding season extends over a very protracted period. I have had eggs taken in early April in the Deccan, and in late September in Behar, whilst Whympers records finding hardset eggs near Naini-Tal at 5,000 feet on the 21st October. In the South it would appear that the favourite nesting month is April, over the central and western portions of its habitat June and perhaps July, and in the drier portions of Behar not until September at the end of the rains.

I think in some parts of its breeding range two broods are reared in the year, for though most of the eggs sent me from Behar have been taken in August and September, I have had others taken in April.

They make their nests in grass, tamarisk or scrub jungle, sometimes in sugar-cane, crops or indigo, but most often in the two first named. The nest itself is generally a rather flimsy affair, composed merely of a small amount of grass added to the fallen material and collected in some hollow, either natural or scratched out by the birds themselves. Occasionally, however, the nest is quite a compact affair, a thick pad some two or three inches deep, being formed of grass, dead leaves and odd fallen twigs.

The number of eggs laid is, I think, most often 6 to 8, but Hume says from 6 to 10, and Jerdon writes of 10 to 12 or even 15 in a clutch. Certainly clutches of 4 and 5 only are by no means rare, and I have frequently had such sent to me which had been advanced in incubation.

The eggs vary in colour from a pale stone colour, which is rare, to a deep olive chocolate brown. The majority are a rather pale olive brown, and in some almost an olive green, in fact they are very much like the eggs of the common pheasant, but the range of variation is proportionately far greater. I have, however, seen no eggs of the beautiful blue variety occasionally taken in clutches of pheasants' eggs. Many eggs, more especially the darker ones, have numerous white specks and blotches formed by a calcareous



deposit, apparently deposited on the egg immediately prior to expulsion, and after the deposition of the colouring matter has been completed. These spots are easily removable with a sharp knife, and the egg then appears to be unicoloured.

The texture is stout, but fine and generally rather glossy, and it is noticeable that the greener the egg the higher the gloss.

Hume's expression of spherio-conoidal exactly expresses the shape of most eggs, others are more oval, whilst at the other extremity some may be found which are of quite exaggerated peg-top shape, the big end being almost flat.

Hume who does not divide the races, gives the average of 70 eggs as  $39.8 \times 33.0$  mm., practically, however, the whole of these are typical *asiæ* as he seems to have had no eggs from Sind, and only 5 taken by Cripps in the Duars which might be attributed to *melanotonus*. He gives the variation in length as  $34.7$  to  $45.8$  mm., and in breadth as  $29.9$  to  $35.0$  mm.

The average of 40 eggs which have passed through my hands is  $35.9 \times 31.3$  mm. The longest and broadest are  $38.6 \times 31.0$  mm. and  $36.3 \times 32.3$  mm., the shortest and narrowest are  $32.6 \times 30.4$  and  $35.2 \times 29.4$ .

The majority of my eggs are, however, from Behar, where the birds are smaller than in the Western area.

*General Habits.*—The one essential for the Black Partridge is cover and lots of it, and if this cover is near water, so much the better, but it is not a *sine qua non*, for many parts of its habitat are very arid and dry. Rajputana and other districts frequented by the Black Partridge elsewhere are very devoid of water except during the rains, yet it seems to hold its own there quite well.

As regards cover, it really does not seem to matter much what this is, but possibly its favourite consists either of grass a few feet high or scrub jungle, which is fairly thick. They haunt thin forest, date and scrub groves, dense *ekra* and *nal* of river beds and swamps, plains of short grass, not two feet high, and practically any kind of cultivated crop which affords sufficient concealment.

I fear that shooting and trapping by natives at all seasons of the year has greatly decreased the numbers of this fascinating bird over most of its range; civilization has destroyed many of its favourite haunts, and the crops which have taken the place of the seas of grass and jungle, though forming quite sufficient cover, have brought with them the ever-hungry native. Hume writes of places where he could make sure of bagging 50 couple to his own gun in one day, though even then he adds where "in past times 60, 70 and 80 brace have been thus brought to book." Hume also tells us of how in six days he and Home shot  $177\frac{1}{2}$  brace of Black Partridge in the Aligarh District besides nearly 200 head of other game. I fear that such

shoots are no longer possible, but still good bags can be had with time available and proper arrangements made, and the charm is as great as ever.

The very cry of this Partridge is a sporting one: "Che-chirree chick-chirree" ringing out in the early morning before the sun is up or the dew off the grass urges the sluggard out of bed. Sometimes the first two words are repeated twice, but generally only the six syllables are uttered, the emphasis being placed on the "chick" and the last syllable of the cry. It is so joyous and musical a call that it cannot but appeal to every lover of Nature, even if he is not a sportsman bent on the murder of the utterer of the cry.

The Black Partridge is a satisfactory bird to shoot, for he rises quite well for an Indian game-bird, gets away fairly quickly, and flies strong and straight, though not at the pace of an English Partridge. Moreover he does not require such hard hitting as one generally takes him as he flies away from the shooter and so he does not present the tough shield of breast feathers presented by the driven bird.

Big coveys are the exception, for the birds soon separate when the young are old enough to look after themselves, and though the cocks and hens keep together throughout the year, even they often wander about some distance apart, so that often shots can be obtained at more than one member of a covey or at both the two birds of a pair.

Shooting with a few beaters in grass or crops is the form of sport with this bird most often indulged in, and from a shooting point of view is certainly the easiest, but birds can also be driven from one piece of cover to another, and then afford faster, harder shots, more like those obtained at a drive of Partridges at home.

In the hills which they ascend certainly up to 6,000 or 7,000 feet, Dodsworth records them at 8,000 in the Simla Hills, one must use dogs to work the heavier jungle which they there frequent, and even then one can hardly hope for bags of any size judging by the standard of the Plains.

Hume describes the joys of a Black Partridge shoot from elephants a sport often indulged in even now, but generally at the end of some tiger or big game shoot, when it no longer matters about disturbing or frightening away the real object of the day's outing. He says that Black Partridge are easy to shoot in such circumstances, and that he saw a Col. Congreve kill with ball cartridge in consecutive shots 6 Black Partridge!!

The natives trap the males in very large numbers to keep as pets. The method adopted is the universal one of surrounding a decoy bird with nooses so that when the wild bird hears the challenge of



the tame he rushes in and gets caught. They are great fighters, and occasionally a tame decoy gets killed by a wild bird that has avoided the nooses, for they are very savage in their attacks, and their long sharp spurs soon inflict a fatal wound.

In captivity they are not used for fighting purposes, or at least they are very seldom so used, though Capt. C. R. S. Pitman informs me that round about Ferozepore they are some times trained for this purpose, but they become tame rapidly, and can be allowed loose in a very short time. They run at a great pace, and their predilection for this form of movement seems even stronger in captivity than when wild as they always answer their master's call on foot rather than by flight.

They crow in captivity all through the months of March, April and May and again, though less often, in August and September, calling continuously through the early morning and after the cool of the evening. In their normal state they are said to call occasionally throughout the year, though principally in March and April, but wherever they are I think that when heard calling they will also be found to be breeding.

The Black Partridges are principally grain and seed-feeders, but also eat any small insects and a good deal of green food. As a dish for the table, most people consider them rather dry and flavourless, but they are not a bad change from endless fowl or goat when one is in camp.

#### FRANCOLINUS FRANCOLINUS HENRICI.

##### *The South Persian Black Partridge.*

*Francolinus henrici*.—Bonap, Compt. Rendu. XLII., p. 882 (1856) (Sindh).

*Francolinus orientalis bogdanovi*.—Zarudny, Orn. Monatsb. XIV., pp. 151, 152, (1906) (Mesopotamia).

*Francolinus orientalis arabistanicus*.—Zarudny. & Harms., Orn. Monatsb. XXI, p. 54 (1913) (Zagrossische and Mesopotamische Gebite Persiens).

*Perdix francolinus*.—Lath. Ind. Orn. II., p. 644 (1790) (part); Temm., Fig. et Gal. III., p. 340 (1815) (part); Vieill. Tabl. Ency. Meth. I., p. 214 (1823).

*Francolinus vulgaris*.—Blyth, Cat. B. Mus. Asiat. Soc., p. 251 (1849) (N. India, etc.); Adams, P. Z. S. 1858, p. 502 (Bombay, Bengal, etc.); id. ibid., 1859, p. 186; Irby, Ibis, 1861, p. 236 (Oudh & Kumaon); Jerd., B. of I. III., p. 558 (1864); Filippi, Viag. Pess. I., p. 351 (1865) (Persia); Hume, N. & E. In. Birds, p. 537 (1873); Hume, Str. Feath. I., p. 226 (1873) (Sind); Le Mes., Str. Feath. III., p. 379 (1875) (Sind); Schalow, Jour. f. Orn., 1876, p. 186 (Persia); Blanf., East Persia II., p. 273 (1876) (Baluchistan, etc.); Doig., Str. Feath. VIII., p. 371 (1879) (E. Narra); Butler, Cat. B. of Sind, p. 54 (1879); Hume & Mars. Game-Birds II., p. 9 (1879); Murdoch, Str. Feath. X., p. 168, (1881). (Sind); Swinh. Ibis. (1882.) p. 119 (S. Afghanistan); Oates cd. Hume's N. & Eggs III., p. 428 (1890); Rattray, Jour. B. N. H. S. XII., p. 345, (1898) (Thull); Blanf., Fauna. B. I. IV., p. 136 (1898); Cumming : Jour. B. N. H. S. XVI., p. 692 (1905) (Seistan); Whitehead, Ibis, p. 269 (1909) (Kurram); id., Jour. B. N. H. S. XX., p. 969 (1911) (Kurram).

*Francolinus francolinus*.—Ogilvie-Grant, Cat. B. M. XXII., p. 136 (1893).

*Francolinus francolinus henrici*.—Hartert, Nov. zool. XXIV., p. 289 (1917).

VERNACULAR NAMES.—Kala-tetur or Kala-tetri (*Hin*); Taru (*Pushtu*).

*Description*.—*Adult Male*.—Similar to *F. f. asiæ*, but paler everywhere. This is more especially the case in regard to the small Sind birds. As regards the extent of the barring, this appears to me to vary individually to such an extent that it is of no value as a sub-specific character. The under tail-coverts are a darker chestnut than they are in *asiæ*, and there is hardly ever any trace of barrings.

*Colours of Soft Parts*.—As in *asiæ*.

*Measurements*.—Birds from Persia and Afghanistan seem to run larger than those from Sind and Baluchistan, the former measuring in their wings from 164 to 175 mm., and the latter from 148 to 163 mm. In colour they agree very well, and I do not consider it necessary to again sub-divide them. The Afghanistan and Sind birds are the palest, whilst the Baluchistan birds, though as small as those from Sind, agree with the Persian birds in being perceptibly darker.

*Adult Female*.—Differs from the female of *F. f. asiæ* in being paler.

*Colours of Soft Parts*.—As in *asiæ*.

*Measurements*.—The only Sind female I have seen has a wing of 149 mm., others of this race vary between 153 and 160 mm.

*Chick in Down* from Fao in Persia varies from the chick of *asiæ* far more than the adults do from one another. Above it is a pale whitish fawn, the central markings more narrow, though longer in shape than they are in *asiæ*. The quills have many light bars and narrower dark ones, making these feathers appear much lighter than they do in the other races. The head is of the palest fawn with a narrow darker centre, and below it is unmarked creamy white.

*Distribution*.—Southern and South-Eastern Persia to Fao and Bagdad, Baluchistan, Afghanistan and Sind.

A specimen from Chitral is undoubtedly of this race, and probably all those found in the hills of the N.-W. Frontier of India as far North as Quetta will prove to be the same.

*Type Locality*.—Sind.

*Nidification*.—There is practically nothing on record about the breeding of this race, but as it is a resident bird, it will be found nesting wherever it occurs.

In Baluchistan and the foot hills of the N.-W. Frontier it breeds, apparently in the thin scrub jungle, and, where there is any, in grass patches. In South Persia it breeds in the sparse grass bordering the rivers and river beds, and also in amongst a species of *Polypodium*, which grows over an enormous area of country during the rains, forming the staple food of Sand Grouse, and perhaps also of this partridge.



The only two eggs I have seen are two in my collection sent me from S. Persia, and taken on 27th April 1917. They are typical normal Black Partridge's eggs, and measure  $37\cdot0 \times 31\cdot0$  and  $37\cdot3 \times 31\cdot0$  mm.

Whitehead and Rattray both found it breeding on the N.-W. Frontier.

*General Habits.*—The Persian Black Partridge inhabits much the same kind of cover as the last bird, but within its Indian limits generally haunts much more broken ground. It is found everywhere in suitable places in the Baluchistan and Afghan Hills up to at least 7,000 feet, and is common up to 4,000 feet in most localities along the frontier.

In Persia it is said to be common along many of the river beds in the Tamarisk and heavy grass which grows so luxuriantly on their banks.

Capt. C. R. S. Pitman informs me that these partridges drink very regularly every morning and evening.

#### FRANCOLINUS FRANCOLINUS MELANONOTUS.

##### *The Assam Black Partridge.*

*Francolinus melanonotus.*—Hume, Stray Feath. XI., p. 305 (1888) (Assam and Manipur).

*Perdix francolinus.*—Lath., In. Orn. II., p. 644 (1790) (Part); Lesson, Traite d'Orn., p. 505 (1831), (Bengal, etc.).

*Francolinus vulgaris*? var *brevipes*.—Hodg. in Grays Zool. Misc., p. 85, (1844), (Nepal, nomen nudum.); id, Icon. ined. in B. M. Nos. 630; Bonap, C. B. XLIII., p. 414 (1856).

*Francolinus vulgaris.*—Stephen in Shaw's Gen. Zool. XI., p. 319, (1819), (Bengal, etc.); Adams, P. Z. S., 1858, p. 502 (Bombay, Bengal, etc.) id, ibid, 1859, p. 186; Irby, Ibis, 1861, p. 236 (Oudh and Kumaon); Jerd, B. of I., III., p. 558 (1864); Blyth., Ibis, 1867, p. 157 (Manbhum); Beavan, Ibis, 1868, p. 383 (Manbhum); Hume, N. & E. In. Birds, p. 537 (1873); Scully, Str. Feath. VIII., pp. 348, 367 (1879) (Nepal Valley); Hume and Mars., Game-Birds, II., p. 9 (1879); Hume, Str. Feath. XI., p. 304 (1888) (Manipur); Oates ed., Hume's N. & Eggs III., p. 428 (1890); Blanf., Jour. B. N. H. S., IX., p. 186 (1894) (Bengal); Stuart Baker, ibid, XII., p. 492 (N. Cachar); Blanf., Fauna. B. I. IV., p. 136 (1898); Stuart Baker, Jour. B. N. H. S., XVII., p. 971 (1907), (Khasia Hills); Higgins, ibid, XXIII., p. 368 (1914) (Manipur).

*Francolinus francolinus.*—Ogilvie-Grant, Cat. B. M. XXII., p. 132 (1893).

*Francolinus francolinus melanonotus.*—Hartert, Nov. Zool. XXIV. p. 290 (1917).

*VERNACULAR NAMES.*—Kais-tetur (*Nepalese*); Tetri-sorai (*Assamese*); Kembi (*Manipuri*); Dao-chirree (*Cachari*); Inrui-jirip (*Katcha-Naga*).

*Description.*—*Adult Male.*—Similar to *F. f. asiae*, but very much darker both above and below; the feathers of the upper parts have the centres very dark brown, sometimes almost black, with their paler edges very narrow and very rufous; the white bars on the rump, upper tail-coverts and tail are very narrow. Below the white spots are generally less round and more oval in shape; on the extreme

lower breast at the sides these bars become longitudinal in shape, the outermost running round the submargin of the feather. The under tail-coverts are darker chestnut, and are unbarred.

The spurs are said to be smaller, and sometimes absent, but I have not noticed this amongst the many I have shot, and this seems to be more a matter of age and individuality.

*Colours of Soft Parts.*—As in *asiæ*, but I think the legs very often seem to be a brighter, richer red in old birds. On the other hand, I have seen some specimens—not in the breeding season, whose legs I should have described as horny-brown. Probably these were young males of the first year.

*Measurements.*—Wings 143 mm. to 155 mm. Birds from Assam and Manipur average a little smaller than those from Sikkim and Nepal, *i.e.*, 149·6 mm. against 152 mm. The former birds are also darker and more richly coloured, the latter are, however, much nearer true *melanotus* than *asiæ*. Birds from Bhagiratti and Bengal are also a trifle larger and paler than those from Assam.

*Adult Female.*—Similar to the Female of *asiæ*, but much darker, and the breasts are much more regularly and profusely barred with black.

*Colours of the Soft Parts.*—As in *asiæ*.

*Measurements.*—Wings 141—149 mm.

*Chick in Down.*—There are none in the British Museum collection, but they are well-known to me, and I think there is a greater contrast between the chicks of the three races than there is in the adults. The chicks of *melanotus* are very richly coloured, the dark portions including the crown are broader in extent, a richer darker chestnut brown, whilst the fulvous below is also much deeper.

*Distribution.*—Eastern Nepal, Sikkim, the whole of Assam and Eastern Bengal and the Hill tracts of Tippera and Chittagong. The birds of Central and West Bengal must also be placed with this race, as must those from Northern Orissa, though both are somewhat intermediate. On the other hand those found in the drier climate of Behar are nearer *asiæ*.

*Type Locality.*—Manipur.

*Nidification.*—The breeding season of this Black Partridge commences in early April, and continues until the first few days of July. Undoubtedly April is the month in which most eggs will be found, and those taken in July will, in many cases, be second broods, for many birds lay twice. In North Cachar, where the birds were very common in the wonderful park-like lands in the North, practically every egg was laid in April immediately after the first light rain had brought on a fresh growth of grass on the burnt lands. In Northern Assam and the Plains of Cachar, Sylhet, etc., the birds occasionally laid in the end of March, and more often in May, and then again in



July. In the Eastern Duars and the foot hills of Nepal, June and May seem to be the two months principally affected as breeding time, but in the higher ranges they once more revert to April.

Everywhere the time is governed by the abundance of food, and this in turn depends on the rainfall and the time of year the natives burn off the grass.

The nest varies considerably. As a rule it is a slight ill-formed pad of dead leaves and grass collected in some small hollow in grass or scrub jungle, but now and then one finds quite a well-made nest. I once came across one near Shillong on the 6th June 1907 placed between grass roots on a small stony grass-covered hill close to the station. Cattle had been feeding in this grass forming little deep tracks amongst the roots, and the nest in question was wedged into one of these. The base of the nest was a thick compact mass of dead leaves, bracken-fronds and grass, and over this was placed a thick lining of grass worked up on either side so that the nest was almost semi-domed. The nearest bracken grew at least 100 yards from the nest, so that in this instance the birds must have gone to some trouble to make their nest comfortable.

They breed up to 6,000 feet, but not often over 4,000, and probably their favourite altitude is under 2,000. They almost always select sun-grass land in which to nest, and seem to prefer such as is from 1 to 3 feet high. A few breed in high grass, ekra, elephant grass and scrub jungle, but even in these instances they are invariably near grass land and, almost equally invariably, the patches themselves are small and not too dense.

The nests are easy to find, for the Cock-bird calls long and cheerily morning and evening close to it, and if one has a little patience it can soon be located, moreover the hen sits very close in the cool of these hours and seldom rises until one almost steps on her, when away she goes with a tremendous whirr of wings and loud protests against being disturbed. In the heat of the day the cock-bird is silent and the hen leaves the nest, so that finding the nest then becomes a mere matter of luck.

As far as my own experience goes this Partridge does not lay large clutches, and I think 4 to 6 is the number most often found, and more than once I have known 3 eggs only to be incubated. I have never seen more than 8 eggs in a clutch, and that only once, and perhaps half-a-dozen times 7 eggs. I think 16 days is the period of incubation, but it may be a day or two more.

The eggs are, as might be suspected, indistinguishable from those of *F. f. asia*, and vary over about the same range of colour as does that bird, but on an average they are darker, and, I think, browner and less olive. At the same time I have had one or two clutches a very distinct dark olive-green.

100 eggs average  $36.5 \times 30.9$  mm.; the longest and shortest measure respectively  $39.0 \times 33.0$  mm. and  $34.0 \times 28.3$  mm., the broadest and most narrow  $37.6 \times 33.3$  mm. and  $34.3 \times 27.7$  mm.

Like all *Francolinus* the cock-bird is monogamous and probably the birds pair for life.

*General Habits.*—The Assam Black Partridge is principally a bird of grass lands, seldom frequenting the scrub and tree jungle so often haunted by the birds of the South and West. This is probably due to the fact that in the humid regions of the North-East, all forests are of such dense and lofty growth that they are not suited to the habits of the birds as are the sparse “Sal” and other forests of the North-West of India.

They are very common in many of the grass lands, both North and South of the Brahmapootra, being found in the long elephant grass and thick reeds close to the river, and in the widest stretches of sun-grass which cover miles upon miles of the plains at the foot hills of the Himalayas. Nowhere, however, do they—as far as I know—exist in numbers sufficient to supply a full day’s sport to anyone out to make a bag, but for the man who wants a day with Nature and his gun, they suffice to supply an excuse and much hard work with a few birds to bring home in the evening.

Many years ago—in 1883 to be exact,—there were still a few birds left in Nadia, some 40 miles from Calcutta but though no one ever shot there, and I never heard of their being trapped, they and the last of the Black Buck disappeared altogether a few years later.

In Sylhet, Cachar and Manipur they were fairly numerous, in the two last places in the grass plains at about 2,000 feet.

Personally I hardly ever shot these birds, as the places they frequented were also the grazing grounds of the Gaur and Buffalo, which one dare not disturb with a shot. The country they were found in North Cachar was extraordinarily beautiful. Great rolling downs, covered with short brilliant green grass and scattered oak-trees, whose great black trunks showed up effectively against the green. Here and there meandered tiny streams, their banks edged with long semi-withered sun-grass which had, from its position, been able to withstand the fires which had burnt the rest of the grass for many miles in all directions. In these strips and in the damper pockets the Black Partridges took up their quarters, and the greetings of their cheery calls as one started out in the early dawn after big game is a sound I shall never forget.

The call made one feel that the birds were full of the absolute joy of life, and it was easy to understand the Mahomedan version of the call “Subhan tere kudrut” (All powerful, who shall describe thy power), the early morning hymn of praise which the Mahomedans say all birds and beasts raise to their Creator.



From the crests of the hill one could see the birds afar off out in the open scratching about and feeding like small barn-door fowls, and every now and then the cock-bird would mount to the crest of an ant-hill or the top of some fallen stump and ring out his hymn of praise. Even in the breeding season and when the cock-birds were calling from many directions, I never saw a calling bird attacked, or, indeed, approached by another, and it never seemed to be either uttered by the birds or accepted by others as a challenge to fight.

They appeared to feed in the open only in the very early mornings and again for about an hour in the evenings before sunset, but they continued to crow much later and to start again earlier, whilst, during the months of March, April and May, one might often hear an odd call at almost any hour of the day.

On the rare occasions I shot them for the pot I found them quite nice eating, but I nearly always had them in a stew-pot, as roast they were rather dry. Birds of the year after they have been feeding in the mustard fields on the young shoots are excellent eating however cooked.

When the hill rice is ripe they are very fond of lying up in the thick cover it affords, and birds shot from them always have their crops full of rice.

The family parties seem to break up in November or early December, but the grass was always so dense and high in these months that it was not easy to know whether one had flushed the whole party or not.

They are very easy to keep in captivity, and become so tame that they can be allowed almost total freedom without fear of losing them except during the breeding season when they naturally require closer looking after.

#### FRANCOLINUS PICTUS PICTUS.

##### *The Southern Painted Partridge.*

*Perdix picta*.—Jard. and Selb., Ill. Orn., pl. 50 (1828) (Bangalore); Jard., Nat. Libi. Orn. IV., p. 103, pl. III. (1834).

*Perdix hepburnii*.—Gray, Ill. Ind. Zool. 1, pl. 55, Fig. 1 (1830-32).

*Francolinus pictus*.—Gray, Gen. B. Ill., p. 505 (1846); Jerd., B. of I., II., p. 561 (1863) (part); Blyth, Ibis, 1867, pp. 157-8; Holdsw., P. Z. S., 1872, p. 469 (Ceylon); Hume, N. and E. Ind. Birds, p. 538 (1873); Fairbank, Str. Feath, IV., p. 262 (1876) (Deccan); Dav. & Wen., ibid, VII., p. 87 (1878) (Deccan); Hume & Mars., Game-B. Ind. II., p. 19 (1879) (part); Legge., B. of Ceylon III., p. 744 (1880); Butler, Cat. B. of S. Bom., p. 68 (1880); Vidal, Str. Feath X., p. 160 (1881) (Western Ghats); Davidson, ibid, p. 316 (1882) (W. Khandesh); Macgregor, ibid, p. 440 (1887) (Deccan & S. Mahratta); Taylor, ibid, p. 530 (1887); Oates ed., Hume's N. & Eggs III., p. 430 (1890) (part); Ogilvie-Grant, Ibis, 1892, p. 40 (part); id., Cat. B. M. XXI., p. 138 (1893); id., Man. Game-

B. I., p. 106 (1895) (part); Oates, Man. Game-B. I., p. 160 (1898) (part); Blanf., Fauna., B. I. Aves. IV., p. 137 (1898); Butler, Jour. B. N. H. S. X., p. 312 (1896) (Ceylon); Davidson, *ibid*, XII., p. 64 (Kanara); Oates, Cat. Egg. B. M. I., p. 37 (1901) (part).

**VERNACULAR NAME.**—Kakera Kodi (*Telegu*).

**Description—Adult Male.**—Crown black with narrow rufous-buff margins to the feathers; forehead, supercilia and sides of the head ferruginous red; nape and neck like the crown but with the buff margins wider and more conspicuous; upper back blackish with oval white spots; wing-coverts blackish brown with buff spots and scapulars the same, but with rufous buff margins. Wing-quills and greater coverts brown with rufous buff bars, broken on the primaries, complete on the inner secondaries on which the brown is almost as dark as on the scapulars. Lower back, rump, upper tail-coverts and central tail feathers black with narrow bars of white, the latter sometimes more or less tinged with buff; outer tail feathers more or less black on the terminal third.

Below, chin white or rufous, more or less marked on the sides with tiny black specks, sometimes forming a line from the corner of the lower mandible; foreneck darker rufous, more boldly streaked with black; breast and flanks black with large white drops increasing in size towards the lower breast and posterior flanks; centre of abdomen and vent dull pale rufous brown, more or less tipped with dirty whitish; under tail-coverts chestnut.

**Colours of the Soft Parts.**—Irides dark brown; legs reddish or yellowish brown; bill dark brown to black, the tip always blackish, the base and gape paler or horny white.

**Measurements.**—Length about a foot, wing 132 to 148 mm., average of 30 specimens 138·5 mm., tail from 66 to 89 mm., generally about 80 mm.; bill from front about 26 mm.; tarsus about 40 mm.

The spurs are rudimentary or absent.

Weight “8·5 to 12·7 ozs.” Hume. This is apparently for both sexes.

**Adult Female.**—Like the male, but with the lower back, rump, upper tail-coverts and tail dull pale brown with narrow bars of white bordered with darker brown. The throat is generally white, and the markings on the flanks and lower breast generally form black arrow head shaped central bars on a pale buffy brown.

**Colours of the Soft Parts.**—As in the male, but duller, the legs are never as red in the reddest legged males, and are rarely even a dull horny brown; the bill is brown rather than black, and with a greater depth of whitish at the base.

**Measurements.**—There seems to be no difference in size between the males and females, though the latter probably weigh distinctly less on an average. I can find no recorded weights.



*Distribution.*—The typical Painted Partridge is found only in Ceylon and in the South of India. In the west and central portion of its range it only occurs well to the south, but on the east works further North. Its northern limits may be taken as Khandesh and Raipur, working up on the east into Behar. The specimens in the British Museum come from Ceylon, Belgaum, Khandesh, Deccan, Raipur, Chanda and Behar. In Ceylon, according to Wait, it is confined to the Ura basin and the eastern and south-eastern slopes of the hills.

*Type Locality.*—Bangalore.

*Nidification.*—Throughout practically the whole area over which both races of this Partridge breed, the breeding season seems to be from the time the rains break, *i.e.*, the middle or end of June up to the end of September, July and August being the months in which most eggs are laid. There are very few eggs of this sub-species in Museums, and the Hume series consists wholly of eggs of *pallidus*, the northern form, but Col. Sparrow sent me a few from Trimulgherry taken in August and September, and I have others from the Buchanan and Bulkley collections taken from July to September. In Ceylon it is said to lay "about Xmas time."

The Painted Partridge appears to select patches or strips of grass and scrub jungle in between cultivated fields and open country rather than extensive stretches of grass-land in which to breed, and its favourite ground is perhaps such as is evergreen with rather thin grass two or three feet high, more or less mixed with bushes. Jerdon, who was not much interested in nidification, long ago remarked on this Partridge's predilection for laying its eggs under the shelter of some bush and my correspondents inform me that they think the majority of nesting sites selected are of this nature. The nest itself is very primitive, merely a few pieces of grass and a few dead leaves on the ground, sometimes in a hollow, sometimes on quite flat ground, where the eggs are only kept from rolling about by the fallen rubbish around them.

The eggs appear to vary in number from 4 to 7 or 8 in a full clutch, and I can find no satisfactory evidence to prove the assertions sometimes made that they lay 10 or 12.

In shape they are very similar to those of the Black Partridge, but whilst some are quite as peg-top in shape as the most pyriform of the eggs of that bird, some are much more of a true oval than any I have seen of *Francolinus francolinus*. In colour they are, on the whole *much* paler, much less brown and more inclined to a pale stone colour or very pale olive-grey. A few eggs are almost a pure grey, and I have seen no eggs of the comparatively dark olive-brown so common in the eggs of the Black Partridge.

In texture they are fine and close, and the surface has a distinct gloss sometimes quite highly developed. They are much more fragile than the eggs of the *Francolinus francolinus*, a difference strikingly great between two species so very closely allied.

The average size of 15 eggs, all I have been able to examine of true *pictus*, is  $35.9 \times 30.9$  mm. The smallest egg both in length and breadth measures  $33.6 \times 28.6$  mm., the longest is  $37.8 \times 31.9$  mm., and the broadest is  $36.5 \times 32.0$  mm.

The Hen-bird is a very close sitter, and will not move until almost trampled on.

The Cock-bird is monogamous, and like the rest of his genus, probably pairs for life.

They breed only in the Plains, and nowhere do they ascend the hills for more than a few hundred feet, and even that only as stragglers.

*General Habits.*—The habits of the Painted Partridge are very similar to those of the Black Partridge, but whereas the latter prefers good cover combined if possible with a certain amount of dampness, the Painted Partridge likes very dry jungle, and does not mind its being rather thin. It never enters the heavy forest of the Western Coast, but wherever cultivation has taken the place of forest, and grass has grown up over the abandoned areas, there almost to a certainty, the Painted Partridge will sooner or later put in an appearance.

Perhaps its favourite haunts are short grass on broken, stony plateaus and plains, or thin scrub jungle, and in either place trees are desiderata, for this bird is much more fond of perching than the Black Partridge. They call like that bird from some elevated, perch but more often from trees rather than from ant-hills boulders and fallen stumps.

Hume says that the Painted Partridge “often, if not generally, roosts on bushes and trees, whence I have shot them after dusk and have disturbed them before dawn”, and he adds that they may often be *seen* perched on some conspicuous part of the tree whilst the hen sits modestly—and wisely—hidden in the thicker foliage.

They are often found in such crops as offer suitable cover, or if the crops themselves are too thin they hide in the adjacent scrub or grass and wander out into the fields in the mornings and evenings to feed, scratching about in the earth and picking up grain, seeds and insects, or feeding on green shoots, etc. White ants are a very favourite food with this bird, as indeed with almost all birds, and it is said to be a foul feeder when living anywhere near villages.

Pitman found that it drank regularly every evening about six o'clock in July in the Central Provinces, but he did not notice it drinking in the morning as the Black Partridge always did.



Although never getting big bags, he obtained very fair sport with the Painted Partridge by driving the grass and scrub round cultivation. The birds were very clever at squatting close until the beaters were almost on them, when they doubled back through their legs or rose and doubled back over their heads, giving no chance of a shot. At other times they rose well and gave capital shots as they crossed the open.

In Hume's time Laird wrote : " 7 or 8 brace of Painted Partridges with 15 brace of Quail, etc., would be here (Belgaum) reckoned a good bag for one gun ", and probably much the same would be the case now. In a few other localities they may be rather more numerous and rather larger bags possible, but I have heard of no place where much over 20 couple can be hoped for in a day's shoot.

Hume says that they fly faster and take more hitting than the Black Partridge, and are about the equal in pace to the English Partridge.

Other sportsmen say that it does not fly nearly so fast as our home bird, and that though it may make more fluster and fuss as it rises, it is much easier to hit, and takes less hitting to bring down than that bird does.

Possibly a Painted Partridge walked up in grass or scrub is not much slower than a common Partridge walked up with dogs through crops affording good cover, but is nothing like as fast as a driven bird coming up with the wind and an inherited instinct of what to expect in front of him.

The call of this bird is not unlike that of the Black Partridge. It has been syllabised by many writers, but perhaps Jerdon's " Chee-kee-kerray Chee-kee-kerray " gives as good an idea of its sound as it is possible to put in words. The birds, both sexes apparently, have also a call to one another sounding like " chuck chuck " repeated softly several times ; this may only be a call note to the young. The latter, according to a writer in the Bengal Oriental Magazine, " begin to call soon and to chirrup like Crickets ", and this cricket-like note is one also uttered by the young of the Black Partridge. I often heard the latter in North Cachar when out big-game shooting, and it was sometime before I found out its origin by putting up a family party of two old birds and three chicks who, on re-settling, commenced chirruping loudly until the whole family was satisfactorily re-united.

The chicks of the Painted and Black Partridges grow their wing quills very rapidly, and can fly as well as their parents for a short distance when they are little larger than sparrows.

The flesh of the Painted Partridge is rather dry, but quite pleasant, and has sometimes been described as excellent.

*(To be continued.)*







77



78a



78



79



80



81



82



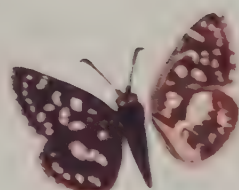
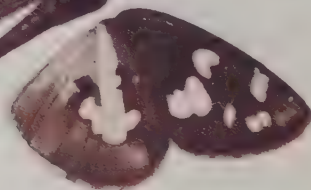
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85a



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89

## THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

### EXPLANATION OF PLATE M.

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Figs. 74, 74 a,	<i>Taractrocera ceramas</i>	♂	♀
„ 75, 75 a,	<i>Telicota bambusæ</i>	♂	♀
„ 76, 76 a,	<i>Taractrocera mœvius</i>	♂	♀
„ 77, 77 a,	<i>Parnara mathias</i>	♂	♀
„ 78, 78 a,	<i>Udaspes folus</i>	♂	♀
„ 79, 79 a,	<i>Suastus gremius</i>	♂	♀
„ 80, 80 a,	<i>Hesperia galba</i>	♂	♀





# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

INCLUDING THOSE MET WITH IN THE HILL STATIONS  
OF THE BOMBAY PRESIDENCY.)

BY

T. R. BELL, I.F.S.

(Continued from page 32 of this Volume.)

PART XXVI.

With plate M.

Family—*HESPERIIDÆ*.

"All six legs perfect. Wings with the discoidal cell of hind wing slenderly and often incompletely closed ; veins 8, 9, 10, 11, all emitted from subcostal nervure before the end of cell and ending on costal margin ; all other veins direct from the cell, none branched either in the fore wing or in the hind wing. Of comparatively small size, generally very robust build and rapid flight. Antennæ wide apart at base, with a thick club or strong, curved hook at the tip. Palpi short, broad, closely pressed against the face, densely scaled on the first and second joints. Hind legs generally with a pair of moveable spurs or spines at the end of tibiæ and another pair at the middle ; middle legs with a pair of moveable spines at end of tibiæ."

The above is more or less in the words of Marshall and deNicèville in their " Butterflies of India, Burmah and Ceylon ". Colonel Bingham characterizes the family thus, as already given in the key to the Butterflies at the beginning of these papers :—

" Antennæ wide apart at base ; hind tibiæ generally with a medial as well as terminal pair of spurs ; all veins in the fore wing from base or from cell ; none forked or coincident beyond."

To this may be added that the eggs are generally few and nearly always more or less dome-shaped, either smooth or longitudinally ribbed more or less strongly, sometimes serrate along the ribs, sometimes tuberculate (rarely).

The larvæ are fusiform, the anal end rounded, sometimes flattened, the head always conspicuously broader and higher than the neck ; no projections of any sort either on the head or on the body in the mature state though (*Gangara* for example) there may be a cereous excretion taking the form of threads that rub off easily.

The pupæ are moth-like in all cases, nearly always smooth, without processes of any kind and are attached by the tail and a body-band.

The habits of the butterflies differ somewhat according to genera and species but the flight is very rapid in the great majority and of a jerky nature in all. Some of the insects are diurnal, some crepuscular in their habits, a few, apparently, even nocturnal (*Ismene gomata*). The larvæ live in cells formed of leaves or sections of leaves in various characteristic ways and the pupation takes place often within them, though many larvæ wander and make special arrangements ; *Baoris*, *Udaspes* pupating more or less in the open



on the under side of a leaf, part of which is drawn together by a few silks to form a concave depression; *Ampittia maro* head-down, absolutely in the open, on a stalk of rice or grass near the ground.

'A proposed Classification of the *Hesperiidæ*, with a Revision of the Genera,' by Lieut. E. Y. Watson, Madras Staff Corps, F.Z.S., F.E.S., which appeared in the 'Proceedings of the Zoological Society, of London,' January 17, 1893, is practically the latest effort at arranging the skippers scientifically into, first, more or less natural groups and, secondly, into proper genera. The work deals with all known species, both from the old world as well as the new world and is based on the study of 234 generic names of which 49 were sunk by the author as synonyms, while 45 new genera were described. He states at the same time that it is based entirely upon the collection of the British Museum while he acknowledges that "in addition to the collection of the British Museum, free access has been afforded me to the valuable collection of Messrs. Godman and Salvin." His time being limited, a certain number of species mentioned were not separated into genera but were included in those to which they seemed to be most nearly allied.

Watson says that, before 1874, no serious attempt had ever been made to arrange the genera of the family into natural groups but that it had been done later for limited faunæ. He then states that the only suggested arrangement that seemed to him to be a perfectly natural one was that of Scudder in the 'Bulletin of the Buffalo Society of Natural Science' (1874). According to this, two sub-divisions were erected for the *Hesperiidæ* of New England in America, namely the *Hesperidi* and the *Pamphilidi*, based to a very large extent upon the secondary sexual characters of the males, the egg, larva and pupa supplying subsidiary characters. Watson approves of these and then alludes to an amplification of Scudder's arrangement by Mabille in 1878 in the 'Annales de la Société Entomologique Belge' which suggest a third tribe called the *Pyrrhopygini*, which he adopts. Speyer then, in 1879, in 'Genera of the *Hesperiidæ* of the European Fauna' published in the 'Stett. ent. Zeitung' made a suggestion that has proved to be of the greatest importance in the classification of genera, namely that the position of vein 5 of the fore wing in relation to veins 4 and 6 would be a character of value. Watson makes full use of this character in his keys. He alludes to the very superficial way in which many authors have characterized their genera and has adhered to the decisions of Scudder in his 'Historical Sketch of the Genera of Butterflies' absolutely to fix the doubtful ones. For genera described after Scudder's work and for which no type was specified, the species that best agreed with the genus was taken as type. He then refers to the male secondary characters on the wings: the costal fold, discal stigma and tufts of hair which he concludes

are of great importance as indicating groups or subfamilies but are of little use as generic characters. All butterflies possessing a costal fold belong to his own *Hesperiinæ*, all possessing a discal stigma to his *Pamphilinæ*. The *Pyrrhopyginæ*, on the other hand, have no secondary male characters of either description on the fore wing, and are confined altogether to the New World.

The characters of the three subfamilies are enumerated in the following key :—

Fore wing with vein 5 usually nearer to 4 than to 6 ; with cell invariably more than two-thirds the length of costa ; without costal fold or discal stigma. Antennæ with club thick, ending in a blunt point usually more or less bent into a hook. Wings held horizontal when at rest .. .. . *Pyrrhopyginæ*.

Fore wing with vein 5 nearly always nearer to 6 than to 4 ; cell rarely more than two-thirds the length of costa ; costal fold sometimes present. Antennæ rarely blunt, nearly always ending in a fine point. Wings nearly always held horizontal in repose .. .. . *Hesperiinæ*.

*Section A.*—Fore wing with vein 5 slightly nearer either to 4 or to 6, never conspicuously close to either ; cell always more than two-thirds the length of costa. Hind wing with vein 5 never fully developed except in a few Old World genera. Antennæ usually bent into a hook, sometimes sickle-shaped, always ending in a fine point. Third joint of palpi never curving over vertex of head. Wings at rest held horizontal or erect over back

*Section B.*—Fore wing with vein 5 nearer to 6 than to 4 ; cell less than two-thirds the length of costa. Hind wing with vein 5 never fully developed. Antennæ seldom hooked, sometimes bluntly pointed. Third joint of palpi never curving over head.

Fore wing with vein 5 nearer to 4 than to 6 ; cell almost always less than two-thirds the length of costa ; males never with a costal fold but sometimes with discal stigma. Hind wing with vein 5 well developed or not. Antennæ almost invariably ending in a fine point. Palpi with the end joint long or short, directed variously, sometimes curving over the head-vertex. The wings are always held closed perpendicularly over the back in complete repose .. *Pamphilinæ*.

*Section A.*—Fore wing with, except in some aberrant Australian forms, vein 5 slightly nearer to 4 than to 6 ; cell always less than two-thirds the length of costa ; no costal fold and rarely a discal stigma. Hind wing with vein 5 never well developed. Antennæ various, never much hooked, usually sharply pointed. Palpus with third joint usually inconspicuous, rarely long and slender when it is always erect and never horizontal. Wings held erect in repose.

*Section B.*—Fore wing with vein 5 much nearer 4 than 6 ; cell less than two-thirds costa ; no costal fold but often a discal stigma. Hind wing with vein 5 rarely developed. Antennæ never hooked, the club sometimes without crook, sometimes with. Palpi in a few genera with the third joint curving over vertex, long and slender ; in most it is minute. The butterflies, when basking, depress the hind wings and elevate the fore wings, “ an attitude peculiar to this section ” (*Watson*).

*Section C.*—Fore wing with vein 5 equidistant between 4 and 6 or nearer 6 ; cell from half to just over two-thirds the length of costa ; no costal fold but with various other sexual male marks on wings and legs. Hind wing with vein 5 usually well developed. Antennæ with the club of varying stoutness, always



tapering to a fine point ; sometimes hooked. Palpi with the second joint upturned, resting against the face ; the third joint long, thin, naked and projecting in front of the face. The wings are always held closed over the back when at rest.

The above key is for all the *Hesperiidæ* of the world. The *Pyrrhopyginæ* are wholly confined to the American continents. Section A of the *Hesperiinæ* has but seven genera out of 50 which are of the Old World and only five that are Indian, namely *Orthophætus*, *Capila*, *Calliana* and *Hantana*, *Crossiura*. Section B contains about 42 genera out of which some 16 are Indian, 5 African, 1 Australian, and the rest American. Section A of the *Pamphilinæ* contains about 34 genera of which 13 are Indian, 6 African, 4 Australian, 3 North Asian and the rest American ; Section B, 59 genera ; 20 Indian, 6 African, the rest American ; Section C, 5 genera, all of the Old World and confined to Eastern Asia, India, Burma to the Philippines and Australia.

Later on, in the Journal of this Society (B. N. H. S.), Capt. Watson as he then was, published a supplementary paper called 'A Key to the Asiatic Genera of the *Hesperiidæ*,' being an excerpt of his original work, written for the convenience of workers in India (Vol. IX, part 4, p. 411 ; 20th June 1895). The original keys have been modified to suit the restricted fauna. They are as follows :—

Fore wing with vein 5 nearer to 6 than to 4 ; male occasionally with a costal fold but never with stigma. Male with a tuft of hair at proximal end of hind tibiæ in nearly every case. Wings in repose always horizontal .. *Hesperiinæ*.

Fore wing with vein 5 nearer to 4 than to 6 ; male never with a costal fold but often with patches of modified scales on upperside. Male without tuft on hind tibiæ. All species rest with their wings closed over the back .. *Pamphilinæ*.

Captain Watson has, as formerly, divided this latter subfamily into three sections ; the first two, in this case, founded on a slight difference of neururation, being purely artificial, have only been adopted for convenience. "The third section, however, consists of a closely allied group of genera which appear to have no near allies among the *Pamphilinæ*, so much so that it is questionable whether it would not be advantageous to form them into an additional subfamily under the name of *Ismeneinæ*, the species contained under which would stand in much the same relation to the remainder of the Old World *Hesperiidæ* that the *Pyrrhopyginæ* do to those of the New World. The name (but with a much more extended meaning) has been made use of by M. Mabille in a paper on the *Hesperiidæ* of the Brussels Museum published in the 'Annals of the Entomological Society of Belgium, Vol. XXI (1878).' These sections of the *Pamphilinæ* he characterises as follows :—

*Section I.*—Palpi various but never as in Section III. Vein 5 of fore wing straight throughout its length and not arising markedly nearer to vein 4 than to

vein 6, the middle discocellular being, therefore, only slightly longer than the lower one.

*Section II.*—Palpi various but never as in *Section III*. Vein 5 of fore wing deflected at origin and consequently arising much nearer to vein 4 than to vein 6, the middle discocellular being, therefore, much longer than the lower one.

*Section III.*—Palpi with the third joint long, slender and naked, porrected horizontally in front of the face. Species robust. Habits often crepuscular.

Watson then gives keys for all the Asiatic genera of Skippers consisting of the following genera under the different sections :—

<i>Section I.</i> — <i>Pamphila</i> ,	<i>Taractrocera</i> ,	<i>Itys</i> ,
* <i>Heteropterus</i> ,	<i>Ochus</i> ,	<i>Zographetus</i> ,
<i>Baracus</i> ,	<i>Ampittia</i> ,	<i>Isma</i> ,
<i>Astictopterus</i> ,	<i>Aëromachus</i> ,	<i>Matapa</i> ,
* <i>Apostictopterus</i> ,	<i>Sebastonyma</i>	* <i>Sepa</i> ,
<i>Sancus</i> ,	<i>Pedestes</i> ,	<i>Pudicitia</i> ,
<i>Koruthaialos</i> ,	<i>Lophoides</i> ,	<i>Acerbas</i> ,
<i>Suada</i> ,	<i>Hyarotis</i> ,	* <i>Zea</i> ,
<i>Suastus</i> ,	* <i>Isoteinon</i> ,	<i>Erionota</i> ,
<i>Iambrix</i> ,	* <i>Idmon</i> ,	<i>Gangara</i> ,
* <i>Ge</i> ,	<i>Arnetta</i> ,	<i>Paduka</i> ,

and states that all, with the exception of those marked with an asterisk, are recorded from Indian limits. These 26 Indian genera contain some 60 species.

<i>Section II.</i> — <i>Kerana</i> ,	<i>Hidari</i> ,	<i>Telicota</i> ,
* <i>Ancistroides</i> ,	* <i>Eetion</i> ,	<i>Padraona</i> ,
<i>Pirdana</i> ,	<i>Pithauria</i> ,	<i>Halpe</i> ,
<i>Plastingia</i> ,	<i>Notocrypta</i> ,	<i>Onryza</i> ,
<i>Lotongus</i> ,	<i>Udaspes</i> ,	<i>Iton</i> ,
<i>Creteus</i> ,	<i>Actinor</i> ,	<i>Baoris</i> ,
* <i>Zela</i> ,	* <i>Gehenna</i> ,	<i>Gegenes</i> ,
* <i>Zampa</i> ,	<i>Cupitha</i> ,	<i>Erynnis</i> ,
* <i>Mimas</i> ,	<i>Augiades</i> ,	* <i>Adopæa</i> ,

of which those with an asterisk are not Indian : 20 genera with some 87 species.

<i>Section III.</i> — <i>Ismene</i> ,	<i>Hasora</i> ,	<i>Rhopalocampta</i> ,
<i>Bibasis</i> ,	<i>Badamia</i> ,	

all 5 represented in India by some 23 species.

He gives the affinities and ranges of the different sections stating that, in *Section I*, “*Pamphila* and *Heteropterus* are closely allied to one another and also, apparently, to *Hesperia* and the closing genera of the preceding subfamily, *i.e.*, *Thanaos*, *Gomalia* and *Carcharodus*.” Of *Section II* he says that the arrangement of the genera appears to be fairly natural and that it connects satisfactorily with the preceding section ; that *Kerana* to *Eetion* appear to be closely allied and to show relationships with *Erionota*, *Sancus*, *Koruthaialos* and *Astictopterus* of *Section I* ; “*Pithauria* is rather out of place, but appears to be close to *Hidari* and is probably a near ally of *Baoris* ; *Notocrypta* and *Udaspes* are certainly closely related to each other but show no particular affinity to any other genera. *Actinor*, *Gehenna*, *Cupitha* and *Onryza* appear to be allied to *Halpe* which is itself close to *Iton* and *Baoris* ; *Padraona* and *Telicota* are hardly generically distinct and are certainly close to *Augiades*, *Erynnis* and *Adopæa* ; while *Gegenes* appears to be allied to both *Baoris* and *Erynnis*.” On the affinities of *Section III* he remarks that it is a well-marked group of closely-allied genera showing no near relationship with any others of the family ; but that the habits and general *facies* agree best with the *Pamphilinæ* ; adding, however, that their neuration appears to have more resemblance to that found in the sub-family *Hesperiniæ* ; and suggests that they might with advantage be treated as a distinct subfamily.

It might be of interest to repeat here what Watson says about the ranges of the different groups. The last or third section, the *Ismeneinæ* (to make a



subfamily of it as Watson suggested and as has actually been done by Swinhoe in *Lepidoptera Indica*, the latest work on Indian Skippers and Indian butterflies generally) is confined to Asia, Africa and Australasia ; *Ismene* and *Bibasis* have not been recorded out of Asiatic limits ; *Hasora* is chiefly Malayan and extends as far as Australia ; *Badamia* also extends to that continent ; *Rhopalocampta* is a very large genus almost entirely confined to Africa, only two or three species being found within Asiatic limits.

In Section II of the *Pamphilinæ*, the genus *Gehenna* has only two species, one from Borneo, one from Sumatra ; *Ancistroides*, in similar case, is confined to islands of the Malay Archipelago ; *Zela*, *Zampa*, *Eetion* are Malayan ; *Mimas* from New Guinea ; *Adopæa* is northern, Holarctic. Extra information given is that *Taractrocera*, *Telicota* extend to the Australasian region ; *Ampittia*, *Baoris*, *Baracus* to Africa ; *Padraona* to Australia, doubtfully to Madagascar and S. America ; *Adopæa*, *Erynnis* are Holarctic.

Section I : all the genera, with the exception of *Pamphila*, *Heteropterus*, are Asiatic ; the former being European, the latter Holarctic. *Heteropterus*, *Isoteinon*, *Ge*, *Idmon*, *Sepa*, *Zea*, *Apostictopterus* have not been recorded from Indian limits. *Isoteinon*, *Heteropterus* are confined to Northern Asia ; *Ge*, *Idmon*, *Zea*, *Sepa* are from Malacca and Sumatra ; *Apostictopterus* has a single species found in China.

Watson's subfamily of *Hesperiinæ* is divisible into two quite natural parts, one consisting of those insects that keep their wings erect in repose, the other containing the species that keep them open and stretched horizontally out.

His *Pamphilinæ* can be at once divided into two quite natural groups, one consisting of Sections I and II, the other of Section III as has already been mentioned by him.

The latest work on the *Hesperiidæ*, from the pen of Colonel C. Swinhoe, has appeared comparatively recently as the climax to the truly monumental *Lepidoptera Indica*, originally started by Moore more than twenty years ago. It occupies part of volume IX and the whole of volume X and is accompanied by fine, coloured plates in which are depicted all the butterflies described with a goodly number of their caterpillars and chrysalides. The author has erected twelve new subfamilies but gives no keys to them. These are :—

Ismeneinæ,	Pamphilinæ,	Matapinæ,
Achalarinæ,	Astictopterinæ,	Notocryptinæ,
Celænorrhinæ	Suastinæ,	Plastingiinæ,
Hesperiinæ,	Erionotinæ,	Erynninæ.

In this arrangement he restricts the subfamily *Hesperiinæ* of Watson to the genera *Carcharodus*, *Gomalia*, *Hesperia* and *Thanaos*, in which the insects do not spread their wings horizontally when at rest ; dividing those that do so rest into *Achalarinæ* and *Celænorrhinæ*. He finally divides off Section III of Watson's *Pamphilinæ* as the subfamily *Ismeneinæ* and erects eight subfamilies for Sections I and II. These two sections Watson himself has allowed to be purely artificial as has been seen above, whereas Swinhoe believes his subfamilies to be fairly natural and, therefore, a better arrangement.

Based upon certain knowledge of the earlier stages of members of all of these, the probabilities are that Swinhoe's belief is correct ; but this knowledge also suggests that certain alterations therein must be made. To start with, therefore, a more natural sequence of the above subfamilies is suggested as follows :—

Achalarinæ,	Erynninæ,	Erionotinæ,
Celænorrhinæ,	Plastingiinæ,	Matapinæ,
Hesperiinæ,	Suastinæ,	Astictopterinæ,
Ismeneinæ,	Pamphilinæ,	Notocryptinæ,

with the first two subfamilies in which the insects sit with wings horizontally spread in natural sequence to the New World *Pyrrhopyginæ*. Then follow all

those resting with wings closed over their backs, connected by the *Hesperiinæ* which occasionally rest with wings in abnormal positions ; as, in *Gomalia* and *Thanaos*, where the position adopted is, occasionally, neither one nor the other. In these two genera the wings are held in a "pent-house" attitude as in the great majority of moths, sloping at an angle along the body ; *Gomalia albi-fasciata*, for example, occasionally rests with the wings in the pent-house position and the abdomen curled up so characteristic of the noctuid genus *Eutelia*. All these butterflies, however, often hold their wings in the normal, erect way characterising the great majority of the subfamilies. In the genus *Hesperia* also, the imagines have the habit of basking with the wings half open, that is with the fore wings slightly opened from the erect position and the hind wings still more separated as do many of the insects of the genera *Telicota*, *Baoris*, *Halpe*, &c.

Although the above represents the most natural sequence of Col. Swinhoe's subfamilies, there are various objections to be made to the groups themselves and to their internal constitution. These twelve groups are best discussed in detail in order :—

*Achalarinæ*.—Will have to stand as nothing is known about the earlier stages : on a general view of the pictures of the insects composing it as given in Colonel Swinhoe's *Lepidoptera indica* the subfamily seems to be quite a natural one.

*Celænorrhinæ*.—Is a natural group and will also stand, even to the component genera and their species. Out of the 13 genera of which it is composed 7 are known in their early stages of egg, larva and pupa and show strong affinities ; all the insects rest with horizontally spread wings as do the *Achalarinæ*.

*Hesperiinæ*.—Also natural within certain limits. The transformations of most of the genera are known and show certain affinities ; the insects rest with their wings perpendicularly raised over their backs except in the case of the genera *Gomalia* and *Thanaos* which at night and in dull weather hold them "pent-house" rather like moths of the genus *Eutelia* and even, like these, curl the abdomen up. However these insects also occasionally close the wings over the back. All the subfamily have eggs with strong meridional ridges except *Gomalia* which has them strongly and densely coarse-tuberculate (the tubercles are, however, arranged in radiating rows) with a 7-sided lid on the top through which the larva emerges—all, indeed, of the eggs are characterized by the fact that the larva emerges through the very top.

*Ismeneinæ*.—Is a very natural group as may be gathered by what has already been said about it. The transformations of *Ismene*, *Rhopolocampta*, *Bibasis*, *Hasora* and *Badamia* are known.

*Erynninæ*.—There is not much to be said for this group as it contains elements that are quite irreconcilable with each other. To begin with the whole of what may be called the Baorine section must be taken out of it : the genera *Baoris*, *Caltoris*, *Chapra* and *Gegenes* ; *Erynnis* will remain. These excerpted genera together with others of the subfamily *Matapinæ* will form a new subfamily which may be styled *Baorinæ*. Colonel Swinhoe's *Matapinæ* will disappear as explained below, the genera *Hyarotis*, *Acerbas*, *Arnetta*, *Zographetus*, *Scobura*, *Sebastonyma*, *Itys*, *Iton* and *Isma* going to *Notocryptinæ* while *Æromachus* (and Swinhoe's new genus *Machachus* erected for one of the sections) go to *Pamphilinæ* ; the only remaining genus which is the type-genus, *Matapa*, going naturally into *Erionotinæ* with which (as evidenced by the earlier stages of *Gangara thyrsis* and *Matapa aria*) it has every affinity.

*Plastinginæ*.—Is seemingly a natural group but, as only a single representative, namely *Plastingia submaculata*, of the various genera contained therein has been bred, it is difficult to say. This particular butterfly is very like *Suastus gremius* in facies and has similar eggs, larva and pupa besides making its cell in the same way so that, from its earlier stages, it should go into *Suastinæ* from which, however, it is separated in the perfect state by having an inconspicuous



third joint to the palpus (although the palpus is very robust and rather long) instead of the long, naked, prominent third joint of *Suastus*, *Iambrix*, *Baracus* and *Suada*; it also has exceptionally long antennæ with an exceptionally long and very much hooked tip to the club; the antennæ of *Suastus*, *Iambrix*, *Baracus* and *Suada* are somewhat shorter and have much shorter hooks or bends.

*Suastinæ*.—Is not a good subfamily but has been separated for the above reasons of palpi; the genus *Suastus* has a strongly few-ribbed egg; *Iambrix* has a smooth one, finely cellular-reticulate under a lens; *Baracus* one with a minutely tuberculate surface under magnification and 17 very fine meridional ribs; in fact the three species representing these three genera are a heterogeneous collection offering nothing much in common except the naked third joints of the palpi. The subfamily will be omitted.

*Erionotinæ*.—Quite a natural group and only requires the addition of *Matapa* to complete it. The transformations of *Gangara thyrsis*, *Matapa aria*, *Erionota thrax* and *Paduka lebadea* are known and serve to characterize it.

*Pamphilinæ*.—Contains *Pamphila*, *Taractrocera*, *Ampittia* and *Ochus*. The genera *Æromachus* and *Machachus*, both formerly known as *Æromachus* but recently split by Swinhœ, must be added. The transformations of *Taractrocera*, *Ampittia* and *Pamphila* are known. The habits of the insects are similar.

*Astictopterinæ*.—Is untenable. The habits and early stages of *Sancus* are identical with those of *Notocrypta* and *Udaspes* so that *Sancus* must go into *Notocryptinæ* into which *Astictopterus*, *Koruthaialos* and *Watsoniella* should be put. *Suada* fits better into *Plastinginæ*.

*Notocryptinæ*.—Is a natural group into which *Sancus*, *Iambrix*, *Astictopterus*, *Koruthaialos* and *Watsoniella* should be put.

So far, then, superseding Swinhœ's arrangement, there will be the following subfamilies to be considered:—

- |                   |                  |                   |
|-------------------|------------------|-------------------|
| 1. Achalarinæ,    | 5. Plastingiinæ, | 9. Baorinæ,       |
| 2. Celænorrrhinæ, | 6. Erionotinæ,   | 10. Notocryptinæ, |
| 3. Hesperiinæ,    | 7. Pamphilinæ,   |                   |
| 4. Ismeneinæ,     | 8. Erynninæ,     |                   |

in which his *Astictopterinæ*, *Suastinæ* and *Matapinæ* have disappeared, while a new subfamily, the *Baorinæ*, has been created. These subfamilies will also, with the exception of numbers 1, 2, 3 and 4, all be slightly different from his in their constitution as regards genera. Their composition, after this reconstruction, is given below, making use of Colonel Swinhœ's genera, but marking with an asterisk (\*) all the new genera created by him—he has made a good few, basing them chiefly upon "male-marks", such as a stigma on the wing or a tuft of hairs. He considers such sex-marks to be of generic importance: a matter of opinion about which there has been no little controversy.

Subfamily *Achalarinæ* (1).

Genus *Achalarus*, Scudder,  
*Calliana*, Moore,  
*Pisola*, Moore,  
*Crossiura*, deN.,  
*Hantana*, Moore.

Subfamily *Celænorrrhinæ* (2)

Genus *Celænorrrhinus*, Hubner.  
*Charmion*, deN.,  
*Daimio*, Murray,  
*Satarupa*, Moore,  
*Tagiades*, Hübner,  
*Odina*, Mabilie,  
*Odontoptilum*, deN.,  
*Ctenoptilum*, deN.,  
*Darpa*, Moore,  
*Abaratha*, Moore,  
*Gerosis*, Mabilie,  
*Coladenia*, Moore,  
*Sarangesa*, Moore,  
*Tapena*, Moore.

Subfamily *Hesperiinae* (3).

Genus *Hesperia*, Fabr.,  
*Pyrgus*, Hübner,  
*\*Spialia*, Swinh.,  
*Gomalia*, Moore,  
*Carcharodus*, Hübner,  
*Thanaos*, Boisduval.

Subfamily *Platingiinae* (5).

Genus *Platingia*, Butler,  
*Lotongus*, Dist.,  
*Zela*, deN.,  
*Hidari*, Dist.,  
*Pirdana*, Dist.,  
*Ærane*, El. & Edw.,  
*Creteus*, deN.,  
*Pithauria*, Moore.  
*Pithauriopsis*, W.-M. & deN.,  
*Pedestes*, Watson,  
*Suastus*, Moore,  
*Suada*, deN.,  
*Arnetta*, Watson,  
*Isma*, Dist.  
*Scobura*, El. & Edw.,  
*Itys*, deN.  
*Sebastonyma*, Watson,  
*Zographetus*, Watson.

Subfamily *Erynninae* (8).

Genus *Erynnis*, Schrank,  
*Augiades*, Hübner,  
*Telicota*, Moore,  
*\*Corone*, Swinn,  
*Padraona*, Moore,  
*Halpe*, Moore,  
*\*Thoressa*, Swinh.,  
*Onryza*, Watson,  
*Actinor*, Watson,  
*Baracus*, Moore,  
*Cupitha*, Moore.

Subfamily *Notocryptinae* (10).

Genus *Notocrypta*, deN.,  
*Sancus*, deN.,  
*Udaspes*, Moore,  
*Hyarotis*, Moore,  
*Iambrix*, Watson,  
*Acerbas*, deN.,  
*\*Tamela*, Swinh.,  
*Astictopterus*, Felder,  
*Koruthaialos*, Watson,  
*Watsoniella*, Bery.

Subfamily *Ismeneinae* (4).

Genus *\*Pola*, Swinh.,  
*\*Gecana*, Swinh.,  
*\*Tothrix*, Swinh.,  
*\*Burara*, Swinh.,  
*Rhopalocampta*, Wall.,  
*Bibasis*, Moore,  
*Hasora*, Moore,  
*Parata*, Moore,  
*Badamia*, Moore.

Subfamily *Erionotinae* (6).

Genus *Erionota*, Mabilie,  
*Gangara*, Moore,  
*Pudicitia*, deN.,  
*Paduka*, Dist.,  
*Matapa*, Moore.

Subfamily *Pamphilinae* (7)

Genus *Pamphila*, Fabr.,  
*Taractrocera*, Butler,  
*Ampittia*, Moore,  
*Ochus*, deN.,  
*\*Aëromachus*, deN.,  
*Machachus*, Swinh.

Subfamily *Baorinae* (9).

Genus *Baoris*, Moore,  
*\*Caltoris*, Swinh.,  
*Chapra*, Moore,  
*Parnara*, Moore,  
*Gegenes*, Hübner,  
*Iton*, deN.

Some justification of the subfamilies resulting from the foregoing analysis is called for. The series begins with those insects which rest with the wings horizontally outspread and never hold them closed together perpendicularly over



the back when in repose, exemplified by the two groups *Achalarinæ* and *Celænorrhinæ*. It is true that nothing is known of the early stages of the first but Colonel Swinhœ quotes Doherty's statement about *Calliana pieridoides* that "it flies in the darkest parts of the forest towards the end of the afternoon, alighting with outspread wings; in the morning it lies concealed, adhering closely to the underside of leaves; then floats lazily up and down the bed of a stream." What is true of one species will probably be true of the others and, if the group be a natural one as it surely has the appearance of being, what is true in respect of the resting position of the members of one genus will be true of the others. The general *facies* of all the species of the subfamily suggest strongly the known species of *Celænorrhinus* of the second subfamily, to which Doherty's remark will equally apply.

*Celænorrhinæ*.—The larval stages of seven out of fourteen genera are known. The eggs are dome-shaped, distinctly ribbed; the larvæ feed upon dicotyledonous vegetation; the chrysalides have well-marked and prominent expansions to the spiracles of segment 2 and the proboscis free beyond the wings and the pupal cell is closed. The butterflies rest with wings horizontally spread.

*Hesperiinæ*.—The eggs are dome-shaped and strongly ribbed; the larvæ feed upon dicotyledonous plants; the pupæ are like those of the preceding family, in that they have strong expansions to the spiracles of segment 2, a free proboscis, and they all are formed in closed cells. The butterflies rest with their wings erect over their backs in repose except that, in the genera *Gomalia* and *Thanaos*, as exemplified by the species *G. albifasciata* and *T. tages* (a home insect), they have the habit of sitting in dull weather and at night with the wings "pent-house" after the manner of noctuid moths, that is with them held slanting, the inner or abdominal margin along the body, the wing thus hiding the body from the side-view; *Gomalia*, indeed, even curls the abdomen up like moths of the noctuid genus *Eutelia*. This latter insect occasionally holds the wings erect while Frohawk says *Thanaos* basks with them outspread. There is thus some abnormality in the group.

*Ismeneinæ*.—Have dome-shaped, ribbed eggs. The larvæ are stout and brightly coloured and feed upon dicotyledons; the pupæ are stout, pink or green in colour, have no prominent expansions to the spiracles of segment 2 and the proboscis is not produced beyond the wings.

*Plastingiinæ*.—Have ribbed eggs as far as the members of it are known—and only *Plastingia* and *Suastus*, a single species of each, have been bred. The larvæ are found on palms (*Calamus*, Cane and *Phoenix*, the Date Palm as well as other palms); the pupæ are fairly stout and have well-developed spiracular expansions to segment 2, a frontal "boss" and a short, free end to proboscis. Butterflies rest with erect wings.

*Erionotinæ*.—Have very finely ribbed eggs, the ribs very numerous and not easily seen; the larvæ feed upon bamboos and palms; the pupæ are formed in closed, spirally coiled, roomy cells and have the proboscis produced free beyond the wings (immensely long in *Gangara*), no prominent spiracular expansions, and possess a rounded bow between the eyes. Insects rest with wings erect.

*Pamphilinæ*.—Eggs finely ribbed or minutely rough-tuberculate, a transition between the ribbed and smooth eggs. Larvæ feed upon grasses. Pupæ formed in more or less laxly made cells, with a somewhat accentuated boss or point between the eyes; proboscis free beyond the wings or not; a well-marked though not prominent spiracular expansion. The wings are held erect in repose.

*Erynninæ*.—Eggs smooth or with very fine ribs with the single exception of the genus *Cupitha* which has eggs similar to those given for the *Plastingiinæ*. The larva of *Cupitha* also feeds upon dicotyledons while those of all the other genera of the subfamily feed upon monocotyledons—palms, bamboos and grasses; it also has an opaque skin whereas all the others have more or less thin skins.

through which the tracheæ can be seen. In fact this genus is abnormal and really fits into no subfamily properly. Pupæ of all the others as well as that of *Cupitha* are rather like each other, have well-developed expansions to spiracles of segment 2, mostly funnel-shaped; the proboscis slightly produced and a slight boss between the eyes. The pupal cell is closed and often, as in the genera *Halpe*, *Thoressa*, is cut free from the plant and falls to the ground. All the insects hold their wings erect in repose and often bask with them separated from that position slightly.

*Baorinæ*.—Eggs quite smooth. Naked-looking, whitish larvæ feeding upon bamboos, grasses or palms. Pupa naked, with a long beak between the eyes, light green with a slight powdering of waxy excretion; no spiracular expansions; a long, spatulate cremastral segment. It is formed on the underside of a leaf or blade with tail-pad and body-string, quite unprotected, except that the edges of the blade are drawn towards each other slightly by a few silks—they are never brought together completely. There is a single exception in *Parnara bada* where the pupa is of the erynnine type and the cell is tightly closed. Indeed, this insect should be included in that subfamily preferably. *Parnara canaraica* has its pupa and cell and larva normal for *Baorinæ*. The insects all rest as in *Erynninæ* and bask similarly.

*Notocryptinæ*.—Eggs limpet-shaped, smooth except that numerous tiny, short ribs (as many as 40 and over) are discernible on the narrow ring or band upon which the eggs stand—they are often brown-red in colour. The larvæ resemble those of the preceding family but have smaller heads. The pupæ are precisely similar but the method of making the cells is different in the earlier stages though the pupal cell is similar. The food plants of the larvæ are grasses or palms or belong to the family *Scitamineæ*, the Gingers, and, therefore, are monocotyledons. The butterflies rest with wings erect.

All the above may be stated in tabular form, based upon the eggs and food-plants of the caterpillars—the larvæ and pupæ will fit in all right:—

Eggs ribbed.

Larvæ feeding upon dicotyledons .. .. Subfamilies 1, 2, 3, 4.

Larvæ feeding upon monocotyledons .. .. Subfamilies 5, 6, 7.

Eggs more or less smooth.

Larvæ feeding upon monocotyledons .. . Subfamilies 8, 9, 10.

And some such arrangement as follows might eventually be found to be the most natural for all the skippers of the world:—

Family *Hesperiidæ*.

Section *Pyrrhopygides*.

Group *Pyrrhopygines*.

Subfamily *Pyrrhopyginæ*.

Section *Hesperiides*.

Group *Celænorrhines*.

Subfamily *Achalarinæ*.

Subfamily *Celænorrhinæ*.

Group *Hesperiines*.

Subfamily *Hesperiinæ*.

Subfamily *Ismeneinæ*.

Section *Baorides*.

Group *Baorines*.

Subfamily *Baorinæ*.

Subfamily *Notocryptinæ*.

It would be absurd, however, to lay down that the above arrangement will eventually prove correct, for the knowledge of the earlier stages of the Skippers of the world is still very scanty. That for the Indian insects of the family is



very incomplete. The number of larvæ recorded of the different subfamilies are :—

<i>Achalarinæ</i>	..	0		
<i>Celænorrhinæ</i>	..	4 out of 23	<i>Celænorrhinus</i> .	
		2	14 <i>Tagiades</i> .	Representing 7 out of 14 genera and 14 species out of 75.
		1	1 <i>Tapena</i> .	
		2	8 <i>Coladenia</i> .	
		2	4 <i>Abaratha</i> .	
		1	2 <i>Odontoptilum</i> .	
		2	6 <i>Sarangesa</i> .	
<i>Hesperiinæ</i>	..	1	4 <i>Spialia</i> .	Or 2 of 7 genera ; 2 out of 12 species.
		1	1 <i>Gomalia</i> .	
<i>Ismeneinæ</i>	..	1 out of 2	<i>Gecana</i> .	
		1	5 <i>Burara</i> .	Or 7 out of 9 genera and 10 out of 24 species.
		2	2 <i>Rhopalocampta</i> .	
		1	1 <i>Bibasis</i> .	
		2	4 <i>Hasora</i> .	
		2	5 <i>Parata</i> .	
		1	1 <i>Badamia</i> .	
<i>Plastingiinæ</i>	..	1 out of 8	<i>Plastingia</i> .	2 out of 12 genera and 2 out of 30 species.
		1	2 <i>Suastus</i> .	
<i>Erionotinæ</i>	..	1 out of 3	<i>Erionota</i> .	
		1	1 <i>Gangara</i> .	4 out of 5 genera and 4 out of 11 species.
		1	1 <i>Paduka</i> .	
		1	5 <i>Matapa</i> .	
<i>Pamphilinæ</i>	..	1	2 <i>Pamphila</i> .	
		2	8 <i>Taractrocera</i> .	3 out of 5 genera ; 4 of 19 species. The <i>Pam-</i>
		1	2 <i>Ampittia</i> .	
<i>Erynninæ</i>	..	1 out of 1	<i>Erynnis</i> .	All genera ; 9 species out of 27. The <i>Erynnis</i> known is the home one ( <i>comma</i> ), the Silver-spotted Skipper.
		3	3 <i>Telicota</i> .	
		1	2 <i>Augiades</i> .	
		1	7 <i>Padraona</i> .	
		1	1 <i>Cupitha</i> .	
		1	1 <i>Baracus</i> .	
		1	2 <i>Machachus</i> .	
<i>Baorinæ</i>	..	1 out of 2	<i>Baoris</i> .	
		4	17 <i>Caltoris</i> .	
		2	5 <i>Chapra</i> .	Or 5 out of 14 genera and 10 out of 47 species.
		2	5 <i>Parnara</i> .	
		1	2 <i>Gegenes</i> .	
<i>Notocryptinæ</i>	..	2 out of 6	<i>Notocrypta</i> .	
		1	1 <i>Sancus</i> .	Amounting to 5 genera out of 8 and 6 species out of 16.
		1	1 <i>Udaspes</i> .	
		1	2 <i>Iambrix</i> .	
		1	1 <i>Hyarotis</i> .	

which means that, all in all, something is known of the earlier stages of 42 genera out of a total of 81 and 61 species out of a total of 261.

As an example of how little has been done in breeding these insects and studying their life-histories it is interesting to know that out of the 64 species of Indian *Hesperiidæ* bred, 57 have been discovered in the Kanara District of the Bombay Presidency alone and that by only three individuals. The earlier butterfly breeding operations in Kanara were published in this Society's Journal (Bombay Natural History Society) in the year 1890 (Vol. V, pp. 260, 349) and continued

in the year 1896 in Vol. X, page 237, again at page 372, further at page 568 and finished in Vol. XI, page 22 in the following year. The part dealing with the Skippers is this last and it is accompanied by some coloured plates of larvæ and pupæ.

There are about 2,350 species of *Hesperiidæ* known to exist in the whole world to-day according to Seitz's great work, the *Macrolepidoptera of the World* of which some 1,000 species are American, 350 African, 200 Palearctic and 800 Oriental. Swinhoe enumerates 761 species from the Oriental Region, excluding Australia and, of these, 283 are purely Indian, by which he understands India, Burma, Ceylon and the Andaman Islands. These belong to 88 genera which he groups into 12 sub-families. These twelve sub-families have been above shown to be reducible to 10.

Out of the 283 species only 62 come into the present papers as butterflies of the Plains and Bombay Hill Stations. All but seven of these have been bred, their transformations and life-histories being carefully noted. Those still remaining to be studied are *Daimio milliana*, Swinh., a single specimen of which was caught on the Ghats in the Kanara District of Bombay in the monsoon at a place called Anshi and *Zographetus ogygia* (Hewits.) of which, similarly, only a single individual was taken near the sea-coast; *Corone (Telicota) palmarum*, Swinh., *Telicota augias*, (Linn.), *Arnetta vindhiana*, (Moore), insects of the drier parts of the country: and *Suastus bipunctus*, (Swinh.), which was also once caught in Kanara. This makes six, but the larva of *Corone palmarum* has really been recorded once as feeding on Date Palm although no descriptions or drawings were seemingly kept (*Indian Museum Notes*, Vol. V No. 3, p. 126, pl. IX) as only the male and female insects are there figured. Similarly the larva of *Rhopalocampta benjamini*, (Guerin), is known to feed upon *Meliosma pungens*, Wall. and *Sabia campanulata* Wall. (Family *Sabiaceæ*) in the Himalayas as discovered by de Rhe-Philippe at Dehra Dun who figured the larvæ and pupa but apparently wrote no descriptions (*J. B. N. H. S.*, Vol. XI, 1898, page 602, pl. W, figs. 30, 30b larvæ; 30c pupa). A list of the 62 species is subjoined, those still requiring attention being marked with an asterisk (\*).

<i>Celænorhinus ambareesa</i> , (M.)	<i>Hasora badra</i> , M.
<i>leucocera</i> , (Koll.)	<i>chabrona</i> , Plötz.
<i>area</i> , (Plötz.)	<i>alexis</i> , M.
<i>Satarupa milliana</i> , Swinh.	(= <i>Parata</i> )
(= <i>Daimio</i> )	<i>butleri</i> , Aurivillius.
<i>Tagiades obscurus</i> , Mabille.	(= <i>Parata</i> )
<i>litigiosa</i> , Möschler.	<i>Bibasis sena</i> , M.
<i>Odontoptilum angulatum</i> , M.	<i>Badamia exclamationis</i> , (Linn.)
<i>Abaratha ransonnettii</i> , Felder.	<i>Rhopalocampta benjamini</i> , Guérin.
<i>Coladenia indrani</i> , M.	<i>Plastingia submaculata</i> , Staud.
<i>Sarangesa dan</i> , (Fabr.)	<i>Suastus gremius</i> , Fabr.
<i>dasahara</i> , M.	<i>bipunctus</i> , Swinh.
<i>purendra</i> , M.	<i>Arnetta vindhiana</i> , (M.)
<i>Tapena thwaitesi</i> , M.	<i>ogygia</i> , Hewits.
<i>Hesperia galba</i> , Fabr.	<i>Gangara thyrsis</i> , Fabr.
(= <i>Spialia</i> )	<i>Matapa aria</i> , M.
<i>Gomalia albofasciata</i> , M.	
<i>Ismene fergussoni</i> , deN.	
(= <i>Gecana</i> )	
<i>gomata</i> , M.	
(= <i>Burara</i> )	



<i>Taractrocera mævius</i> , Fabr.	( = <i>Caltois</i> )
ceramas, Hewits.	seriata, M.
( = <i>nicévillei</i> , Swinh.)	( = <i>Caltois</i> )
<i>Ampittia dioscorides</i> , (Fabr.)	conjuncta, Herr,-Schäff.
<i>Aeromachus jhora</i> , deN.	( = <i>Caltois</i> )
( = <i>Machachus</i> )	colaca, M.
<i>Telicota-bambusæ</i> , M.	( = <i>Caltois</i> )
augias, Linn.	mathias, M.
palmarum, M.	( = <i>Chapra</i> )
( = <i>Corone</i> )	subochracea M.
mæsoïdes, Butler.	( = <i>Chapra</i> )
( = <i>Padraona</i> )	canaraica, M.
<i>Padraona gola</i> , M.	( = <i>Parnara</i> )
<i>Halpe moorei</i> , Watson.	bada, (M.)
hyrtacus, deN.	( = <i>Parnara</i> )
astigmata, Swinh.	<i>Gegenes nostradamus</i> , Fabr.
( = <i>Thoressa</i> )	<i>Notocrypta restricta</i> , M.
honorei, deN.	fisthamelii, (Boisd.)
( = <i>Thoressa</i> )	<i>Sancus subfasciatus</i> , (M.)
<i>Baracus hampsoni</i> , El. & Edw.	<i>Udaspes folus</i> , Cramer.
<i>Cupitha purreea</i> , M.	<i>Hyarotis adrastus</i> , (Cramer.)
<i>Baoris farri</i> , M.	<i>Iambrix salsala</i> , M.
kumara, M.	

These insects will arrange themselves in their proper subfamilies as under :—

Subfamily <i>Celænorrhinæ</i> (1).	Subfamily <i>Ismeneinæ</i> (3).
Genus <i>Celænorrhinus</i> 1.	Genus <i>Ismene</i> 11.
Species <i>ambareesa</i> (1).	Species <i>fergussoni</i> (16)
leucocera (2).	( <i>Gecana</i> )
area (3).	gomata (17)
<i>Satarupa</i> 2.	( <i>Burara</i> )
(= <i>Daimio</i> )	<i>Hasora</i> 12.
milliana (4).	badra (18).
<i>Tagiades</i> 3.	chabrona (19).
obscurus (5).	alexis (20).
litigiosa (6).	( <i>Parata</i> )
<i>Odontoptilum</i> 4.	butleri (21).
angulatum (7).	( <i>Parata</i> )
<i>Abaratha</i> 5.	<i>Bibasis</i> 13.
ransonnettii (8).	sena (22).
<i>Coladenia</i> 6.	<i>Badamia</i> 14.
indrani (9).	exclamationis (23).
<i>Sarangesa</i> 7.	<i>Rhopalocampta</i> 15.
dan (10).	benjamini (24).
purendra (11).	Subfamily <i>Plastingiinæ</i> (4).
dasahara (12).	Genus <i>Plastingla</i> 16.
<i>Tapena</i> 8.	Species <i>submaculata</i> (25).
thwaitesi (13).	<i>Suastus</i> 17.
Subfamily <i>Hesperiinæ</i> (2).	gremius (26).
Genus <i>Hesperia</i> 9.	bipunctus (27).
(= <i>Spialia</i> )	<i>Arnetta</i> 18.
Species <i>galba</i> (14).	vindhiana (28).
<i>Gomalina</i> 10.	<i>Zographetus</i> 19.
albofasciata (15).	ogygia (29).

Subfamily *Erionotinae* (5).

Genus *Gangara* 20.

Species *thyrsis* (30).

*Matapa* 21.

*aria* (31).

Subfamily *Pamphilinae* (6).

Genus *Taractrocera* 22.

Species *mævius* (32).

*ceramas* (33).

=*nicévillei*.

*Ampittia* 23.

*dioscorides* (34).

*Æromachus* 24.

(*Machachu*)

*jhora* (5).

Subfamily *Erynninae* (7).

Genus *Telicota* 25.

Species *bambusæ* (36).

*augias* (37).

*palmarum* (38).

(*Corone*)

*mæsoides* (39).

(*Padraona*)

*Padraona* 26.

*gola* (40).

*Halpe* 27.

*moorei* (41).

*hyrtacus* (42).

*astigmata* (43).

(*Thoressa*)

*honorei* (44).

(*Thoressa*)

*Baracus* 28.

*hampsoni* (45).

*Cupitha* 29.

*purreea* (46).

Subfamily *Baorinae* (8).

Genus *Baoris* 50.

Species *farri* (47).

*kumara* (48).

*seriata* (49).

*conjuncta* (50).

*colaca* (51).

*mathias* (52).

*subochracea* (53).

*bada* (54).

*canaraica* (55).

*Gegenes*

*nostradamus* (56).

Subfamily *Notocryptinae* (9).

Genus *Notocrypta* 52.

Species *restricta* (57).

*feisthamelii* (58).

*Sancus* 33.

*subfasciatus* (59).

*Udaspes* 34.

*folus* (60).

*Hyarotis* 35.

*adrastus* (61).

*Iambrix* 36.

*salsala* (62.)

Although the above is the most natural grouping of sub-families, it is not easy to make a key to them all. The first four come in quite easily but the last five are very difficult to co-ordinate. The key is as follows :—

A.—Insects in repose with wings extended horizontally.

*Fore wing* : with vein 5 always nearer to 6 than to

4. Eggs strongly ribbed. Larvæ feeding on dicotyledonous plants .. .. *Celaenorrhinae*.

B.—Insects with wings in repose either held erect over the back or slanting along the body. *Fore wing* : with vein 5 various.

a. Insects with wings either erect or slanting.

*Fore-wing* : vein 5 always nearer to 6 than to 4.

Small butterflies never more than 37mm. in expanse. Eggs strongly ribbed. Larvæ feeding on dicotyledonous vegetation .. .. *Hesperiinae*.

b. Insects with wings invariably held erect when resting. *Fore wing* : vein 5 various.

a1. *Fore-wing* : vein 5 various. *Palpi* : robust, the second joint held pressed against face, erect, the third joint naked, long and directed out horizontally, or nearly so, in front of head. Eggs all strongly ribbed. Larvæ feeding upon dicotyledons. Robust, large insects, with an expanse of wing from 45mm., at least to 75mm. .. .. *Ismeninae*.



b1. *Fore wing* : vein 5 never nearer to 6 than to 4 ; sometimes from or very nearly from the middle of the discocellulars, *i.e.*, half way between 4 and 6 ; mostly nearer to 4. *Palpi* : never as in *Ismeneinæ*. Eggs various. Larvæ feeding upon monocotyledons ; the only exception is *Cupitha purreea*, placed in the *Erynninæ*.

a2. *Antennæ* : with the tip of club blunt, never with a point, be that point ever so small .. .. . *Pamphilinæ*.

b2. *Antennæ* : with the tip of the club with a point, well-marked in the great majority of cases, sometimes small, but always present.

a3. *Eyes* : bright blood-red. Eggs extremely finely ribbed, the ribs indistinct ; dome-shaped, about double as broad as high. Larvæ feeding upon palms, bamboos or on plantains, the pupa makes a spiral cell and that of *Gangara* has an enormously long proboscis. .. .. . *Erionotinæ*.

b3. *Eyes* : never red.

a4. Breadth of head divided into the length of antenna, always over 2.1mm., the least number being 2.3mm. In all these insects the head is small, the antennæ rather long. The larvæ are very similar to those of the *Baorinæ* and the pupa is also very like those of that subfamily and is naked and formed in an open cell made by a silk or two fixed across a half cylinder so to speak, this half cell being caused by the shrinking of the silks: on the undersides of the leaves for *Udaspes*, *Noto-crypta* and *Sancus*. The eggs are all limpet-shaped, blood-red, quite smooth standing on a narrow, shelving, basal ring or band. The foodplants are grasses and gingers (*Scitamineæ*, formerly known as *Zinziberaceæ*) as far as is known .. .. .

*Nctocryptinæ*.

b4. Breadth of head divided into length of antenna never over 2.3mm ; nearly always 2mm., or less, down to 1.4mm. All insects with broad heads, especially so in the subfamilies *Baorinæ* and *Erynninæ*. Eggs ribbed or more or less smooth—always ribbed and strongly so in *Plastingiinæ* ; quite smooth in *Baorinæ* and less so in *Erynninæ*.

a5. *Hind wing* : underside with white dots at most, never with bands, black dots or large spots and never with dark clouding or *fasciæ* or streaks of

any kind. Eggs all smooth. Larvæ all white with broad anal segment. Pupæ like those of *Notocryptinæ*; naked, green, with a long, conical snout in front, a proboscis free beyond the wings and no spiracular expansions. The cell is formed as for that sub-family. The foodplants of all the larvæ are bamboos and grasses. *Baorinæ*

- b5. *Hind wing*: never as in *Bacrinæ* on the underside.

a6. *Hind wing*: underside with black dots. Eggs few, and strongly ribbed, with an apical ring. Larvæ as in *Erynninæ*. Pupæ also similar. Cell formed by cutting out an oval piece of blade with the midrib as one side, tightly closed all round and cutting it free so that it falls to the ground. Foodplants of larvæ are bamboo, palms or cane .. .. *Plastingiinæ*.

- b6. *Hind wing*: underside not as above. Eggs smooth or ribbed, generally the former. Larvæ with thin skins. Pupæ with large spiracular expansions to segment 2. Cell tightly closed. Foodplants, grasses and bamboos .. *Erynninæ*.

(To be continued.)



## BIRDS OF THE INDIAN EMPIRE.

BY

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It is now 22 years since the last volume of Blanford's and Oates' Avifauna of British India appeared and it is to be hoped that before very long the Secretary of State for India may see his way to sanction a new edition of the Fauna. Pending this, however, it seems desirable that something should be done to show our workers in India what has been accomplished since that excellent series was published. With this idea in view I have compiled the following Catalogue.

It does not for a moment pretend to be complete for much yet remains to be done in working out species, genera and even the families of our Indian Birds. On the other hand our advance in Indian ornithological knowledge has been great since 1898 and many ornithologists have contributed to this advance. First and foremost must be placed Dr. E. Hartert of Tring Museum whose wonderful work on Palaearctic birds (*Die Vogel Palæartischen Fauna*) contains an endless wealth of information on all our Indian visitors from Northern climes in addition to much on more purely tropical forms. The late Col. H. H. Harington did useful work amongst the *Timeliidæ* and others, including the writer, have from time to time worked out certain families, genera and species.

The classification adopted is that of Oates' but certain birds have been removed from one family to another on account of discoveries made since the Fauna was written. Especially has this been the case in the sub-family *Brachypteryginæ* which has been transferred almost *en bloc* to the *Turdidæ*.

The Catalogue has been arranged principally with a view to economy in space and contains only the following details. The scientific and trivial name of each bird; the first reference with date; when the name in the reference is identical with that given in the Catalogue it is not repeated but when trinomials are used in the Catalogue and only binomials in the reference the initial letter of the generic name is given and not the name in full and where the generic name differs from the Catalogue name the reference is then given in full. Serial numbers are given and following these the number in brackets according to the Fauna of British India. When one number covers more than one race or species in the Fauna it is repeated in the Catalogue but when a species or sub-species is given which is not referred to at all in the Fauna the second number is left blank. After the reference the date is given and then the type locality in brackets and, in some cases where it is necessary to narrow the type limits given, a second locality is noted and *underlined* and this second name must be considered the type locality in future.

This is required as in some instances, such as "Himalayas", "India", etc., the one locality may cover numerous races and it is therefore imperative to designate more clearly the area of the bird originally described.

The distribution is given in all cases in which Blanford's and Oates' species are divided into geographical races or in which the distribution as given in the Fauna has had to be amended or added to.

Details of reasons for alterations to names or for sub-divisions into sub-species are, of course, impossible in the space available and have been left out for future articles on particular families and genera.

When the Catalogue is completed a table will be given showing the full name of all the references.

The Society intends, I understand, to bring out the Catalogue in book form and this, especially if interleaved, should form a useful hand list to collectors in which to note down their collections and an easy book to annotate and keep up to date as further species are worked out.

## HAND-LIST OF THE "BIRDS OF INDIA."

### Order PASSERES.

#### Family CORVIDÆ.

1. (1) **Corvus corax laurencei.** *The Punjab Raven.*  
C. laurencei, *Hume, Lahore to Yarkand*, p. 235 (1873), (*Punjab*).  
Punjab, Bombay, U. P., N. W. P. Rare straggler Kashmir and C. P.
2. (1) **Corvus corax tibetanus.** *The Himalayan Raven.*  
C. tibetanus, *Hodg., Ann. Mag. Nat. His., 2nd Series*, 3, p. 203 (1849), (*Sikkim*).  
Himalayas from Kashmir to E. Tibet.
- 3.\* (2) **Corvus corax umbrinus.** *The Brown-necked Raven.*  
C. umbrinus, *Sundev., K. Vet. Acad. Forh. Stockh.* p. 199 (1838), (*Senaar*).  
Sind, Baluchistan, S. Persia, Arabia, Palestine and ? N. E. Africa.
4. (3) **Corvus corone orientalis.** *The Eastern Carrion Crow.*  
*Eversm., Add. Pal. Zool. fasc. ii*, p. 7 (1841), (*Buchtarma*)  
Kashmir, N.-W. Frontier, Siberia, Yenesei to Japan.
- 5†. (4) **Corvus coronoides levaillanti.** *The Indian Jungle-Crow.*  
C. levaillanti, *Less., Traite d'Orn.* p. 328 (1831), (*Bengal*).  
Northern India S. of Himalayas.

\* The Indian Brown-necked Raven does not seem to me to be identical with all the African birds which probably form several races, one of which is *ruficollis*.

† The various races of Indian Jungle-Crow are only sub-species of the Australian *coronoides*.



6. (4) **Corvus coronoides intermedius.** *The Himalayan Jungle Crow.*  
C. intermedius, Adams, P.Z.S., 1850, p. 171 (Sikkim).  
Himalayas E. to Sikkim and Bhutan.
7. (4) **Corvus coronoides andamanensis.** *The Burmese Jungle-Crow.*  
C. andamanensis, Beavan, Ibis, 1866, p. 420 (Andamans).  
Assam, Burma, Siam, Malay States and Andamans.
8. (4) **Corvus coronoides culminatus.** *The Southern J Crow.*  
C. culminatus, Sykes, P. Z. S., 1832, p. 96 (Deccan).  
India from the Deccan South to Ceylon.
9. (5) **Corvus frugilegus tschusii.** *The Eastern Rook.*  
Hartert, Vog. Pal. 1., p. 14 (1903), (Gilgit).  
Afghanistan, Baluchistan, Kashmir, Ladak.
10. (6) **Corvus cornix sharpei.** *The Eastern Hooded Crow.*  
C. sharpei, Oates, Fauna B. I. i, p. 20 (1889), (Peshawar).  
W. Siberia, Turkestan, Afghanistan, Baluchistan.  
Winter N. W. India.
11. (7) **Corvus splendens splendens** *The Indian House-Crow.*  
C. splendens, Vieill, Nouv. Dict. d'His. Nat. viii, p. 44 (1817),  
(Bengal).  
All India except Sind.
12. (7) **Corvus splendens zugmeyerii.** *The Sind House-Crow.*  
Laubm., Orn. Monatsb. xxi, p. 93 (1913), (Las Bela, S. E. Balu-  
chistan).  
Sind, Baluchistan. Winter adjoining N. W. F. P.
13. (8) **Corvus splendens insolens.** *The Burmese House-Crow.*  
C. insolens, Hume, Str. Feath. ii, p. 480 (1874), (Tennas-  
serim).  
Burma, Siam and Malay Peninsula.
14. (8) **Corvus splendens protegatus.** *The Ceylon House-Crow.*  
Madar. Orn. Monatsb. xii, p. 195 (1904), (Colombo).  
Ceylon.
15. (9) **Corvus monedula collaris.** *The Kashmir Jackdaw.*  
C. collaris, Drum., A. M. N. H. xviii, p. 11 (1846), (Mace-  
donia).  
From E. Russia to Turkestan, Persia, N. W. India and  
Kashmir.
16. (10) **Pica pica bactriana.** *The Kashmir Magpie.*  
P. bactriana, Bp. Consp.  
N.-W. India to Kashmir.

17. (10) **Pica pica sericea.** *The Chinese Magpie.*  
*P. sericea*, Gould, *P.Z.S.*, 1845, p. 2 (*Amoy, China*).  
 Shan States, Kachin Hills into China.
18. (11) **Pica pica bottanensis.** *The Black-rumped Magpie.*  
*P. bottanensis*, Deless., *Rev. Zool.*, 1840, p. 100 (*Butan*).  
 N.-E. Sikkim into Tibet.
19. (12) **Urocissa erythrorhyncha erythrorhyncha.** *The Chinese Red-billed Blue Magpie.*  
*Corvus erythrorhynchus*, Gmel., *Sys. Nat.* i, p. 372 (1788),  
 (*China*).  
 Yunnan into China.
20. (12) **Urocissa erythrorhyncha occipitalis.** *The Red-billed Blue Magpie.*  
*Psilorhinus occipitalis*, Blyth, *J. A. S. B.* xv, p. 27  
 (1846), (*N. W. Himalayas*).  
 N. W. Himalayas to Assam.
21. (12) **Urocissa erythrorhyncha magnirostris.** *The Burmese Red-billed Blue Magpie.*  
*Psilorhinus magnirostris*, Blyth, *J. A. S. B.* xv, p. 27  
 (1846), (*Ya Ma Dong Mt.*).  
 Burma and Siam.
22. (13) **Urocissa flavirostris flavirostris.** *The Yellow-billed Blue Magpie.*  
*Psilorhinus flavirostris*, Blyth, *J. A. S. B.* xx, p. 28 (1846),  
 (*Darjiling*).  
 N.-E. Himalayas to Nepal, Sikkim and Tibet.
23. (13) **Urocissa flavirostris cucullata.** *The Western Yellow-billed Blue Magpie.*  
*U. cucullata*, Gould, *B. of A. V.*, pl. 51 (1861), (*Kulu Valley*).  
 N.-W. Himalayas and W. Nepal.
24. (14) **Cissa chinensis chinensis.** *The Green Magpie.*  
*Coracias chinensis*, Bodd., *Tabl. Pl. En.*, p. 38 (1783),  
 (*China*).  
 India and Burma to China.
25. (15) **Cissa ornata.** *The Ceylon Magpie.*  
*Pica ornata*, Wagler, *Isis*, 1829, p. 749 (*Ceylon*).  
 Ceylon.
26. (16) **Dendrocitta vagabunda.** *The Indian Tree-Pie.*  
*Coracias vagabunda*, Lath. *Ind. Orn.* i, p. 171 (1790),  
 (*India*), (*Calcutta*).  
 India, Burma and S. China.
27. (17) **Dendrocitta leucogastra.** *The Southern Tree-Pie.*  
*D. leucogastra*, Gould, *P. Z. S.*, 1833, p. 57 (*Malabar Coast*).  
 Southern India, North to the Wynaad Hills.



28. (18) **Dendrocitta sinensis himalayensis.** *The Himalayan Tree-Pie.*  
*D. himalayensis*, Blyth, *Cat.* p. 92 (1865), (*Himalayas*).  
 N. W. Himalayas to Chin Hills and Arrakan.
29. (18) **Dendrocitta sinensis assimilis.** *The Burmese Tree-Pie.*  
*D. assimilis*, Hume, *Str. Feath.* v., p. 117 (1877), (*Muleyit*).  
 Burma S. of Chin Hills, Shan States and Siam.
30. (19) **Dendrocitta frontalis.** *The Black-browed Tree-pie.*  
*D. frontalis*, McClell., *P. Z. S.*, 1839, p. 163 (*Assam*).  
 Nepal to E. Assam N. & S. of the Brahmapootra River.
31. (20) **Dendrocitta bayleyi.** *The Andaman Tree-Pie.*  
*D. bayleyi*, Tytler, *J. A. S. B.* xxxii., p. 88 (1863), (*S. Andamans*).  
 Andamans.
32. (21) **Crypsirhina varians.** *The Black Racket-tailed Magpie.*  
*Corvus varians*, Lath. *Ind. Orn. Supp.* xxvi, (1801) (*Java*).  
 Lower Burma, Siam, Cochin China, to Java, Sumatra, Borneo.
33. (22) **Crypsirhina cucullata.** *The Hooded Racket-tailed Magpie.*  
*C. cucullata*, Jerdon, *Ibis*, 1862, p. 20 (*Thayetmyo*).  
 Central South Burma, Siam and N. Malay Peninsula.
34. (23) **Platysmurus leucopterus.** *The White-winged Jay.*  
*Glaucopis leucopterus*, Temm., *Pl. Col.* no. 265 (1824), (*Sumatra*).  
 Extreme S. of Burma, Siam, Malay Peninsula, Sumatra.
35. (24) **Garrulus lanceolatus.** *The Black-throated Jay.*  
*Vigors*, *P. Z. S.*, 1830, p. 7 (*Himalayas*).
36. (25) **Garrulus leucotis leucotis.** *The Burmese Jay.*  
*G. leucotis*, Hume, *P. A. S.*, Bengal, 1874, p. 443, (*Kaukaryit*).  
 N. W. Burma, Chin and S. Shan Hills to S. Burma.
37. (25) **Garrulus leucotis oatesi.** *Sharpe's Jay.*  
*G. oatesi*, Sharpe, *Bull.*, *B. O. C.* v., p. 44, 1896 (*Chin Hills*).  
 N. E. Burma, E. Chin and Kachin Hills, N. Shan States.
38. (26) **Garrulus bispecularis bispecularis.** *The Himalayan Jay.*  
*G. bispecularis*, Vigors, *P. Z. S.*, 1831, p. 7 (*Himalayas*).  
 N. W. Himalayas to Nepal.

39. (26) **Garrulus bispecularis interstinctus.** *The Sikkim Jay.*  
*Hartert, Nov. Zool. xxv, p. 430 (1918), (Darjiling).*  
 Sikkim, Eastern Nepal.
40. (26) **Garrulus bispecularis persaturatus.** *The Khasia Hills Jay.*  
*Hartert, ibid (Shillong).*  
 Hills South of Brahmapootra.
41. (26) **Garrulus bispecularis rufescens.** *The Yunnan Jay.*  
*G. rufescens, Reichenow, Orn. Monatsbr., p. 123 (1897),*  
*(N. Yunnan).*  
 Yunnan.
42. (26) **Garrulus bispecularis haringtoni.** *The Chin Hills Jay.*  
*G. haringtoni, Rippon, Bull. B. O. C. xv., p. 97 (1905), (Mt. Victoria).*  
 Chin Hills, Kachin Hills and ? N. Shan States.
43. (27) **Nucifraga caryocatactes hemispila.** *The Himalayan Nutcracker.*  
*N. hemispila, Vigors, P. Z. S., 1830, p. 8 (Himalayas).*
44. (28) **Nucifraga multipunctata.** *The Larger Spotted Nutcracker.*  
*Gould, P. Z. S., 1849, p. 23 (N. W. Himalayas).*
45. (29) **Pyrhcorax pyrrhcorax.** *The Red-billed Chough.*  
*Upupa pyrrhcorax, Linn., Syst. Nat., p. 118 (1758),*  
*(England).*
46. (30) **Pyrhcorax graculus.** *The Yellow-billed or Alpine Chough.*  
*Corvus graculus, Linn., Syst. Nat., p. 158 (1766), (Swiss Alps).*
47. **Podoces hendersoni.** *Henderson's Ground-Chough.*  
*Hume, Ibis, 1871, p. 408 (Yarkand).*
48. **Podoces humilis.** *Hume's Ground-Chough.*  
*Hume, Ibis, 1871, p. 408 (Sanju Pass, Yarkand).*

## Family PARIDÆ.

49. (31) **Parus major cinereus.** *The Indian Grey Tit.*  
*P. cinereus. Vieill, Nouv. Dict. d'His. Nat. xx., p. 316*  
*(1818), (Java).*  
 N. India, Assam, W. Burma, Sunda Is, Java.
50. (31) **Parus major intermedius.** *The Afghan Grey-Tit.*  
*P. boharensis var. intermedius, Sarudny, Bull. Proc. Nat.*  
*Moscow (No. 3.) Vol. 3, p. 789 (1890), (S. W. Transcaspia).*  
 Baluchistan, Afghanistan, N.-E. Persia and S.-W. Transcaspia.



51. (31) **Parus major kaschmiriensis.** *The Kashmir Grey-Tit.*  
*Hartert, Vog. Pal. 3, p. 345 (1905), (Gilgit).*  
 Kashmir, Garhwal, Simla and hills of the N.-West.
52. (31) **Parus major planorum.** *The Punjab Grey-Tit.*  
*Hartert, Nov. Zool. xii, p. 499 (1905), (S. Punjab).*  
 Plains of N.-W. India and South Punjab.
53. (31) **Parus major mahrattarum.** *The Southern Grey-Tit.*  
*Hartert, ibid, p. 499 (Ceylon).*  
 South India and Ceylon.
54. (32) **Parus major tibetanus.** *The Tibet Grey-Tit.*  
*Hartert, Vog. Pal. 3, p. 346 (1905), (Chaksam).*  
 S. E. Tibet, Yunnan and ? Kauri Kachin Hills.
55. (32) **Parus major commixtus.** *The Burmese Grey-Tit.*  
*P. commixtus, Swinhoe, Ibis, p. 63 (1868), (S. China).*  
 Tennasserim, Eastern Burma, Shan States and South China.
56. (33) **Parus nuchalis.** *The White-winged Black-Tit.*  
*P. nuchalis, Jerdon, Madr. Jour. L. S. xiii, p. 131 (1844),*  
*(Eastern Ghats).*
57. (34) **Parus monticolus.** *The Green-backed Tit.*  
*Vigers, P. Z. S., 1831, p. 22 (Himalayas), (Simla).*
58. **Parus cyanus tianschanicus.** *The Tianschan Blue-Tit.*  
*Cyanistes cyanus var tianschanicus, Menzbier, Bull. Z. S, France, ix, p. 276 (1884) (Mt. bordering the deserts of Central Asia).*
59. **Parus palustris korejewi.** *The Turkestan Marsh-Tit.*  
*P. communis korejewi, Zarud. and Harms., Orn. Monatsb. x, p. 54 (1902), (Karatau Turkestan).*  
 Turkestan, Afghanistan, Baluchistan and extreme N. W. India.
60. **Parus palustris pœcilopsis.** *The Yunnan Marsh-Tit.*  
*P. Pœcilopsis, Sharpe, Bull. B. O. C. 13, p. 11 (1902), (Chatung, W. Yunnan).*  
 S. W. China and Yunnan.
- \*61. (35) **Ægithaliscus concinna iredalei.** *The Red-headed Tit.*  
*Stuart Baker, Bull. B. O. C. xli, p. 2 (1920), (Simla).*  
 Himalayas from Chitral to the Mishmi Hills over 5,000 ft.

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\* *Æ. erythrocephalus* is invalidated by Linnes *Parus erythrocephalus* x ed, p. 191 (1758). The generic name will therefore be *concinna* of Gould 1855 and a new name has to be given to the Indian race.

62. (36) *Ægithaliscus concinna manipurensis*. *Hume's Red-headed Tit*.  
*A. manipurensis*, *Hume, Str. Feath.* 2, p. 254 (1888), (*Manipur*).  
 Hills South of the Brahmaputra over 4,000 ft.
63. (36) *Ægithaliscus concinna pulchellus*. *The Shan Red-headed Tit*.  
*A. pulchellus*, *Rippon, Bull. B. O. C.* p. 2 (1900) (*Nanoi, Shan States*).  
 Southern Shan States.
64. (36) *Ægithaliscus concinna talifuensis*. *Rippon's Red-headed Tit*.  
*A. talifuensis*, *Rippon, Bull. B. O. C.* 14, p. 18 (1903) (*Gyidyn, North Shan States*).  
 Mts. E. of Talifu, Yunnan, S. W. China, N. Shan States.
65. *Ægithaliscus bonvaloti bonvaloti*. *The Chinese Black-headed Tit*.  
*A. bonvaloti*, *Oustalet, Ann. Pc. Nat. Zool.* (7) xii, p. 286 (1891), (*Ta-tsien-lu*).  
 Western China, Yunnan and N. E. Shan States.
66. *Ægithaliscus bonvaloti sharpei*. *Mt. Victoria Black-headed Tit*.  
*A. sharpei*, *Rippon, Bull. B. O. C.* xiv, p. 84 (1904), (*Mt. Victoria*).  
 Mt. Victoria, Chin Hills.
67. (37) *Ægithaliscus leucogenys*. *The White-cheeked Tit*.  
*Orites leucogenys*, *Moore, P. Z. S.* xxii, p. 139 (1855), (*Afghanistan*).
68. (38) *Ægithaliscus niveogularis*. *The White-throated Tit*.  
*Orites niveogularis*, *Gould, (Mocre), P. Z. S.* xxii., p. 140 (1855), (*North India*).
69. (39) *Ægithaliscus ioschistus*. *The Rufous-fronted Tit*.  
*Parus ioschistos*, *Hodg., Jour. A. S. B.* xiii, p. 943 (1844), (*Nepal*).
70. (40) *Sylviparus modestus modestus*. *The Yellow-browed Tit*.  
*S. modestus*, *Burton, P. Z. S.*, 1835, p. 154 (*Nepal*).  
 Nepal, Sikkim and Hills N. of Brahmapootra.
71. (40) *Sylviparus modestus saturator*. *The Chinese Yellow-browed Tit*.  
*S. saturator*, *Rippon, Bull. B. O. C.* xvi, p. 87 (1900), (*Mt. Victoria*).  
 Burma, China and Assam Hills S. of Brahmapootra.



72. (40) **Sylviparus modestus simlaensis.** *The Simla Yellow-browed Tit.*  
*Stuart Baker, Bull. B. O. C. xxxviii, p. 8 (1917), (Simla).*  
 Hills about Simla, Kashmir and probably hills further N.-W.
73. (41) **Maclolophus spilonotus spilonotus.** *The Indian Black-spotted Yellow Tit.*  
*Parus spilonotus, Blyth, Cat. B.M. A. S. xvi, p. 445 (1849), (Himalayas) N. Cachar.*  
 Nepal to Miri Hills and Hills South of Brahmapootra.
74. (41) **Maclolophus spilonotus subviridis.** *The Burmese Black-spotted Yellow Tit.*  
*Parus subviridis, Tick. (Blyth), J. A. S. B. xxiv, p. 265 (1855), (Tennasserim.)*  
 Burma, Chin Hills, Shan States.
75. (42) **Maclolophus xanthogenys xanthogenys.** *The Yellow-cheeked Tit.*  
*Parus xanthogenys, Vigors, P. Z. S., 1831, p. 23 (Himalayas) (Murree).*  
 Murree to Nepal and Sikkim.
76. (43) **Maclolophus xanthogenys aplonotus.** *The Southern Yellow-cheeked Tit.*  
*Parus aplonotus, Blyth, J. A. S. B. xvi, p. 444 (1847), (Mt. of Central India).*  
 Mt. of S. India as for N. as Behar and Chota Nagpore.
77. (255) **Melanochlora sultanea sultanea.** *The Sultan Tit.*  
*Parus sultaneus, Hodg., Ind. Rev., 1836, p. 31 (Nepal).*  
 Himalayas from Nepal to Burma, Shan States and N. Siam.
- 78.\* (255) **Melanochlora sultanea flavocristata.** *The Malayan Sultan Tit.*  
*Parus flavocristatus, Lafresn., Mag. Zool., 1837, pl. 80 (Tennasserim).*  
 South Burma, Siam and Malay States.
79. (44) **Lophophanes melanolophus.** *The Crested Black Tit.*  
*Parus melanolophus, Vigors, P. Z. S., 1831, p. 23 (Himalayas).*
80. (45) **Lophophanes ater æmodius.** *The Himalayan Cole-Tit.*  
*Parus æmodius, Hodg. (Blyth), J. A. S. B. xiii, ii, p. 943 (1844), (Nepal).*
81. (46) **Lophophanes rubidiventris.** *The Rufous-bellied Crested Tit.*  
*Parus rubidiventris, Blyth, J. A. S. B. xvi, p. 445 (1847) (Nepal).*

\* A very poor sub-species distinguished by its slightly smaller size.

82. (47) **Lophophanes rufonuchalis rufonuchalis.** *The Simla Black Tit.*  
*Parus rufonuchalis*, *Blyth, J. A. S. B. xviii*, p. 110 (1849),  
*(Simla).*  
 Turkestan, Himalayas, Chitral to Garhwal.
83. (48) **Lophophanes rufonuchalis beavani.** *The Sikkim Black Tit.*  
*Lophophanes beavani*, *Blyth, Jerd. B. I. ii.*, p. 275 (1863),  
*(Sikkim).*  
 Nepal, Sikkim, Tibet and W. China.
84. (49) **Lophophanes dichrous dichrous.** *The Brown Crested Tit.*  
*Parus dichrous*, *Hodg. Blyth, J. A. S. B. xiii*, p. 943 (1844),  
*(Nepal).*  
 Himalayas, S. Kashmir to Sikkim.
85. (49) **Lophophanes dichrous wellsi.** *The Yunnan Brown Crested Tit.*  
*Stuart Baker, Bull. B. O. C. xxxvii*, p. 8 (1917), *(Yunnan).*  
 Yunnan and ? N. Shan States.
86. **Remiz coronata.** *The Turkestan Penduline Tit.*  
*Ægithalus coronatus*, *Severtz., Izr. Obs. Moskov. viii*, 2, p.  
 136 (1873), *(Syr Darya).*  
 Transcaspia, West Turkestan, East Persia to Sind  
 and N. W. P.

## Family PARADOXORNITHIDAE.

87. (50) **Conostoma æmodium.** *The Great Parrot-billed Babbler.*  
*C. æmodius*, *Hodg., J. A. S. B. x*, p. 857 (1841), *(Nepal).*
88. (51) **Paradoxornis flavirostris.** *Gould's Parrot-billed Babbler.*  
*Gould, P. Z. S.*, 1836, p. 17 *(Nepal).*
89. (52) **Paradoxornis guttaticollis.** *Austen's Parrot-billed Babbler.*  
*A. David, Nouv. Arch. Mus. vii, Bull.*, p. 14 (1871), *(Setchuan Moupin).*
90. (53) **Suthora unicolor.** *The Brown Suthora.*  
*Heteromorpha unicolor*, *Hodg., J. A. S. B. xii*, p. 448  
 (1843), *(Nepal).*
91. (55) **Suthora nipalensis.** *The Ashy-eared Suthora.*  
*Hodg., Ind. Rev. ii*, p. 32 (1838), *(Nepal).*
92. (56) **Suthora poliotis poliotis.** *The Ashy-breasted Suthora.*  
*S. poliotis*, *Blyth, J. A. S. B. xx*, p. 522 (1851), *(Cherrapoonji)*  
 Hills S. of Brahmapootra to Kachin Hills.



93. (54) **Suthora poliotis humii**. *The Black-fronted Suthora*.  
S. humii, Sharpe, Cat. B. M. vii, p. 487 (1883), (Nepal).  
Nepal, Sikkim to Darjiling.
94. (54) **Suthora poliotis feæ** *Salvadori's Suthora*.  
S. feæ, Salvadori, Ann. Mus. Civ. Genoa vii, p. 364 (1889),  
(Karennee).  
Karennee, S. Shan States.
95. (56) **Suthora poliotis ripponi**. *Rippon's Suthora*.  
S. ripponi, Sharpe, Bull. B. O. C. xv., p. 96 (1905), (Mt.  
Victoria)  
Chin Hills.
96. **Suthora verrauxi craddocki**. *Bingham's Suthora*.  
S. craddocki, Bingham, Bull. B. O. C. xiii., p. 54 (1904),  
(Loipang-Nan).  
Hills of the Mekong watershed 8,500 feet.
97. **Suthora webbiana brunnea** *Anderson's Suthora*.  
S. brunnea, Anderson, P. Z. S., 1871, p. 211 (Momien  
Yunnan).  
Yunnan and the Kachin Hills, E. of Bhamo.
98. (37) **Suthora fulvifrons**. *The Fulvous-Fronted Suthora*.  
Blyth, J. A. S. B. xiv, p. 579 (1845), (Nepal).
99. (58) **Suthora ruficeps ruficeps**. *The Red-headed Suthora*.  
Chleuasicus ruficeps, Blyth, J. A. S. B. xiv, p. 578 (1845),  
(Sikkim).  
Sikkim and Hills N. of Brahmapootra E. to Dafla Hills.
100. (59) **Suthora ruficeps atrisuperciliaris**. *The Black-browed Suthora*.  
Chleuasicus ruficeps var. atrisuperciliaris. Godw.—Aus.,  
P. A. S. B., 1877, p. 147 (Sadiya, Assam.)  
Hills S. of Brahmapootra and E. of Dibong R. to  
Shan States.
101. **Neosuthora davidiana thompsoni**. *Thompson's Suthora*.  
Suthora thompsoni, Bingham, Bull. B. O. C., xiii., p. 63  
(1903), (Kyatpin).  
Lalang State, Burma.
102. (60) **Psittiparus ruficeps ruficeps**. *The Red-headed Parrot-billed Babbler*.  
Paradoxornis ruficeps, Blyth, J. A. S. B. xi, p. 177 (1842),  
(Sikkim).  
Sikkim and Assam E. to Abor Hills N. of Brahmapootra.
103. (60) **Psittiparus ruficeps bakeri**. *Baker's Parrot-billed Babbler*.  
Scaerhynchus ruficeps bakeri, Hartert, Nov. Zoo. vii., p. 548  
(1900), (N. Cachar).  
Hills S. of Brahmapootra to Chin Hills

104. (61) **Psittiparus gularis gularis.** *The Grey-headed Parrot-billed Babbler.*  
*Paradoxornis gularis* (Horsf.), Gray, *Gen. B. ii.*, p. 389 (1849), (*Sikkim*).  
 Sikkim to the extreme E. of Assam N. of Brahmapootra.
105. (61) **Psittiparus gularis transfluvialis.** *Hartert's Parrot-Billed Babbler.*  
*Scaerhynchus gularis transfluvialis*, Hartert, *Nov. Zool. vii.*, p. 548 (1900), (*N. Cachar*).  
 Hills S. of Brahmapootra, Manipur, Chin Hills.

## Family TURDOIDIDÆ.

## Sub-family Turdoidinæ.

106. (62) **Dryonastes ruficollis.** *The Rufous-necked Laughing-Thrush.*  
*Ianthocincla ruficollis*, Jard. and Sel., *Ill. Orn 2nd S.*, pl. 21 (1838), (*Himalayas*).
107. (63) **Dryonastes nuchalis.** *Ogle's Laughing-Thrush.*  
*Garrulax nuchalis*, Godw.—Aus., *Ann. Mag. Nat. His.* (4) xviii., p. 411 (1876), (*Dibrugarh, Assam*).
108. (64) **Dryonastes chinensis.** *The Black-throated Laughing-Thrush.*  
*Lanius chinensis*, Scop., *Del. Flor. et Faun. Insubr. ii.*, p. 86 (1786), (*China*).
109. (65) **Dryonastes cœrulatus cœrulatus.** *The Grey-sided Laughing-Thrush.*  
*Cinclosoma cœrulatus*, Hodg., *As. Res. xix.*, p. 147 (1836), (*Nepal*).  
 Nepal, Sikkim, Assam, Naga and Cachar Hills and Manipur.
110. (66) **Dryonastes coerulatus sub-coerulatus.** *The Shillong Laughing-Thrush.*  
*Garrulax sub-coerulatus*, Hume, *Str. Feath. vii.* p. 140 (1878), (*Shillong*).  
 Khasia Hills only.
111. **Dryonastes coerulatus kaurensis.** *The Kachin Laughing-Thrush.*  
*D. kaurensis*, Rippon, *Bull. B. O. C. xii.*, p. 13 (1901), (*Bhamo*).  
 North and Central Kachin Hills.
112. (67) **Dryonastes sannio.** *The White-browed Laughing-Thrush.*  
*Garrulax sannio*, Swinh., *Ibis*, 1867, p. 403 (*China*).



113. (68) **Dryonastes gallanus.** *Austen's Laughing-Thrush.*  
*Garrulax gallanus*, *Godw.-Aus.*, *P. Z. S.*, 1874, p. 44  
*(Manipur).*  
 Manipur and Chin Hills.
114. (69) **Garrulax leucolophus leucolophus.** *The Himalayan White-crested Laughing-Thrush.*  
*Corvus leucolophus*, *Hardw.*, *Trans L.S.xi*, p. 208 (1815).  
*(Mt. above Hardwar).*  
 Himalayas from Simla to N. Chin Hills, Kachin Hills and N. Burma.
115. (70) **Garrulax leucolophus belangeri.** *The Burmese White-crested Laughing-Thrush.*  
*G. belangeri*, *Less.*, *Trait. d'Orn.*, p. 648 (1831).  
 Pegu, Shan States, S. Chin and Kachin Hills.
116. (71) **Garrulax leucolophus diardi.** *The Siam White-headed Laughing-Thrush.*  
*Turdus diardi*, *Less.*, *Trait d'Orn.* p. 408 (1831), *(Siam)*  
*(Bangkok).*  
 S. Yunnan, Siam, Cambodia, Cochin China and S. E. Tennasserim.
117. (72) **Garrulax pectoralis pectoralis.** *The Black-gorgeted Laughing-Thrush.*  
*Ianthocincla pectoralis* *Gould*, *P. Z. S.*, 1835, p. 186  
*(Nepal).*  
 Nepal to extreme E. Assam, N. Burma and N. Shan States.
- 118.\* (72) **Garrulax pectoralis semitorquata.** *Grant's Laughing-Thrush.*  
*G. semitorquata*, *O. Grant*, *Bull. B. O. C. x*, (1900)  
*(Five Finger Mt. Hainan).*  
 South Burma, S. Shan States, Yunnan, Siam, Hainan.
119. (73) **Garrulax moniliger moniliger.** *The Necklaced Laughing-Thrush.*  
*Cinclosoma moniligera*, *Hodg.*, *As. Res. xix*, p. 147 (1836),  
*(Nepal).*  
 Nepal to E. Assam, Arrakan, Chin Hills and N. Shan States.
120. (73) **Garrulax moniliger fuscata.** *The Burmese Necklaced Laughing-Thrush.*  
*Stuart Baker*, *Bull. B. O. C. xxxviii*, p. 64 (1918), *(Tavoy).*  
 Southern Burma and Siam in the Peninsula and S. Central Burma.
121. (74) **Garrulax gularis.** *McClelland's Laughing-Thrush.*  
*Ianthocincla gularis*, *McClell.*, *P. Z. S.*, 1839, p. 150  
*(Cachar).*

\* *G. leucotis* of Blyth is a synonym of *G. pectoralis* and *G. meridionalis* of Kloss (*Ibis*, 1920, p. 11) does not seem to be distinguishable from *semitorquata*.

122. (75) **Garrulax delesserti.** *The Wynaad Laughing-Thrush.*  
*Crateropus delesserti.* Jerd., *Madr. Jour. L. S. x*, p. 256 (1839), (*Wynaad, S. India*).
123. (76) **Garrulax albogularis.** *The White-throated Laughing-Thrush.*  
*Ianthocincla albogularis,* Gould, *P. Z. S.*, 1835, p. 187 (*Nepal*).
124. (77) **Garrulax strepitans.** *Tickell's Laughing-Thrush.*  
*G. strepitans,* Blyth, *J. A. S. B. xxiv*, p. 268 (1858), (*Mt. Muleyit*).
125. (78) **Ianthocincla ocellata ocellata.** *The White-spotted Laughing-Thrush.*  
*Cinclosoma ocellatum,* Vigors, *P. Z. S.*, 1831 p. 55 (*Himalayas*).
126. (79) **Ianthocincla cineracea cineracea.** *The Ashy Laughing-Thrush.*  
*Trochalopteron cineraceum,* Godw.—*Aus.*, *P.Z.S.*, 1874, p. 45 (*Naga Hills*).  
Cachar, Manipur, Naga Hills East into Chin Hills.
127. **Ianthocincla cineracea styani.** *Styan's Laughing-Thrush.*  
*Trochalopteron styani,* Oustalet, *Bull. Mus. Paris* 6, p. 226 (1898), (*Ta-t sien-lu*).  
Yunnan and Eastern Shan States.
128. (80) **Ianthocincla rufogularis rufogularis.** *The Rufous-chinned Laughing-Thrush.*  
*Ianthocincla rufogularis,* Gould, *P. Z. S.*, 1835, p. 48 (*Himalayas*) (*Sikkim*).  
Nepal, Sikkim, Bhutan and Hills N. of Brahmapootra.
129. (80) **Ianthocincla rufogularis assamensis.** *Hartert's Laughing-Thrush.*  
*Hartert, Vog. Pal. i*, p. 635, (1910) (*Margherita*).  
Hills S. of Brahmapootra, E. to Lakhimpur, S. to Chit-tagong.
130. (80) **Ianthocincla rufogularis occidentalis.** *The Kashmir Laughing-Thrush.*  
*Hartert, Vog. Pal. i*, p. 635 (1910) (*Dehra Doon*).  
Kumaon, Kashmir and N.-W. Himalayas.
131. (81) **Ianthocincla austeni austeni.** *The Cachar Laughing-Thrush.*  
*Trochalopteron austeni,* Godw.—*Aus.*, *J. A. S. B. xxxix*, ii., p. 105 (1870), (*Hengd ng Peak, Cachar Hills*).  
Khasia, Cachar and Naga Hills.



132. (81) **Ianthocincla austeni victoriae.** *The Chin Hills Laughing-Thrush.*  
*I. victoriae*, Rippon, *Bull., B. O. C. xvi*, p. 47 (1906),  
 (Mt. Victoria).  
 Chin Hills.
133. (82) **Trochaloptery erythrocephalum erythrocephalum.** *The Red-headed Laughing-Thrush.*  
*Cinclosoma erythrocephalum*, Vigors, *P.Z.S.*, 1831, p. 171  
 (Himalayas), (Chamba).  
 Himalayas, Chamba to West and Central Nepal.
134. (85) **Trochaloptery erythrocephalum nigrimentum.** *The Sikkim Red-headed Laughing-Thrush.*  
*Trochalopteron nigrimentum* (Hodg.) Oates, *Hume's N. and E. 2nd Ed.* 1, p. 57 (1889), (*Nepal*).  
 Eastern Nepal, Sikkim and East Assam to the  
 Dibong R.
135. (83) **Trochaloptery erythrocephalum erythrolæma.** *Hume's Red-headed Laughing-Thrush.*  
*T. erythrolæma*, Hume, *Str. Feath. xi*, p. 163 (1881),  
 (Matchi, Manipur).  
 Manipur and Chin Hills.
136. **Trochaloptery erythrocephalum godwini.** *Godwin-Austin's Red-headed Laughing-Thrush.*  
 Harington, *Bull. B. O. C. xxxiii*, p. 92 (1914), (*N. Cachar Hills*).  
 Cachar and Naga Hills and ? E. in the Hills S. of  
 Brahmapootra.
137. **Trochaloptery erythrocephalum woodi.** *Wood's Red-headed Laughing-Thrush.*  
 Stuart Baker, *Bull. B. O. C.*, xxxv, p. 17 (1914), (*Loi-Sing, N. Shan States*).  
 Northern Shan States and Kachin Hills.
138. (84) **Trochaloptery erythrocephalum chrysoptery.** *The Shillong Yellow-winged Laughing-Thrush.*  
*Ianthocincla chrysoptera*, Gould, *P. Z. S.*, 1835, p. 48  
 (Khasia Hills).  
 Khasia Hills only.
139. (86) **Trochaloptery erythrocephalum melanostigma.** *Blyth's Red-headed Laughing-Thrush.*  
*Garrulax melanostigma*, Blyth, *J. A. S. B. xxiv*, p. 268  
 (1855), (*Mt. Muleyit*).  
 Karennee, Mt. Muleyit, Tennasserim.
140. (87) **Trochaloptery phœniceum phœniceum.** *The Nepal Crimson-winged Laughing-Thrush.*  
*Ianthocincla phœnicea*, Gould, *Icon. Av.*, pl. 3 (1837),  
 (Nepal).  
 Nepal, Sikkim and Hills North of Brahmapootra.

141. (87) **Trochalopteron phœnicium bakeri.** *The Assam Crimson-winged Laughing-Thrush.*  
*Hartert, Bull., B. O. C. xxiii, p. 10 (1909), (N. Cachar).*  
 Hills South of Brahmapootra, Manipur and Chin Hills.
142. (87) **Trochalopteron phœnicium ripponi.** *The Burmese Crimson-winged Laughing-Thrush.*  
*T. ripponi, Oates, Bull. B. O. C. xi, p. 10 (1900), (Kachin Hills).*  
 Kachin Hills, Shan States North and South.
143. **Trochalopteron milnei sharpei.** *The Burmese Red-tailed Laughing-Thrush.*  
*T. sharpei, Rippon, Bull. B.O.C. xii, p. 13 (1901), (Kengtung State).*  
 Kachin Hills and N. Shan States.
144. (88) **Trochalopteron subunicolor.** *The Plain-coloured Laughing-Thrush.*  
*Trochalopteron subunicolor, (Hodg.) Blyth, J. A. S. B. xii p. 952 (1843), (Nepal).*
145. (89) **Trochalopteron affine affine.** *The Black-faced Laughing-Thrush.*  
*Garrulax affinis, (Hodg.) Blyth, J. A. S. B. xii, p. 950 (1843), (Nepal).*  
 Nepal, Sikkim and Bhutan.
146. **Trochalopteron affine oustaleti.** *The Yunnan Black-faced Laughing-Thrush.*  
*Hartert, Vog. Pal. i, p. 633 (1909), (Tsekore).*  
 Yunnan.
147. (90) **Trochalopteron variegatum variegatum.** *The Eastern Variegated Laughing-Thrush.*  
*Cinclosoma variegatum, Vigors, P. Z. S., 1831, p. 56 (Himalayas), (E. Nepal).*  
 Eastern Himalayas from Chamba to Nepal.
148. (91) **Trochalopteron variegatum simile.** *The Western Variegated Laughing-Thrush.*  
*Trochalopteron simile, Hume, Ibis, 1871, p. 408 (Far N. West), (Gilgit).*  
 Western Himalayas, N.W. Kashmir, Gilgit to Chitral.
149. (92) **Trochalopteron squamatum.** *The Blue-winged Laughing-Thrush.*  
*Ianthocincla squamata, Gould, P. Z. S., 1835, p. 48 (Himalayas), (Sikkim).*
150. (93) **Trochalopteron cachinans cachinans.** *The Nilgiri Laughing-Thrush.*  
*Crateropus cachinans, Jerd., Madr. Jour. x, p. 255, pl. 7 (1839), (Nilgiris).*  
 Nilgiris.



151. (94) **Trochalopteron cachinans cinnamomeum.** *Davison's Laughing-Thrush.*  
T. cinnamomeum, Davison, *Ibis*, 1886, p. 204 (unknown).  
Davison suggests Palni Hills.
152. (95) **Trochalopteron jerdoni jerdoni.** *The Banasore Laughing-Thrush.*  
Garrulax jerdoni, Blyth, *J. A. S. B.* xx, p. 522 (1851)  
(Banásore Peak).  
The Hills of Coorg, Wynaad, Palghat, Palni.
153. (96) **Trochalopteron jerdoni fairbanki.** *The Travancore Laughing-Thrush.*  
T. fairbanki, Blanford, *J. A. S. B.* xxxvii, ii, p. 175 (1868)  
(Palni Hills).  
Hills of South Travancore.
154. (97) **Trochalopteron jerdoni meridionale.** *Blanford's Laughing-Thrush.*  
T. meridionale, Blanford, *Hume Str. Feath.* vii, p. 36 (1878)  
(Travancore).  
Hills of North Travancore.
155. **Trochalopteron elliotti yunnanense.** *The Yunnan Laughing-Thrush.*  
T. yunnanense, Rippon, *Bull. B. O. C.* xix, p. 32 (1900)  
(Yangtze, Yunnan).  
Hills of Yunnan.
156. **Trochalopteron henrici.** *Prince Henry's Laughing-Thrush.*  
T. henrici, Oustalet, *Ann. Sci. Nat.* (7) xii, p. 274 (1899)  
(Tibet).  
Tibet.
157. (98) **Trochalopteron virgatum.** *The Manipur Streaked Laughing-Thrush.*  
*Godw.-Aus.*, *P. Z. S.*, 1874, p. 46 (Razami).  
Hills South of Brahmapootra, Manipur, Looshai and Chin Hills.
158. (99) **Trochalopteron lineatum lineatum.** *The Himalayan Streaked Laughing-Thrush.*  
*Cinclosoma lineatum*, Vigors, *P. Z. S.*, 1831, p. 56 (Nepal).  
Nepal and Sikkim.
159. (99) **Trochalopteron lineatum griseicentior.** *The Simla Streaked Laughing-Thrush.*  
*Hartert. Vog. Pal.* i, p. 636 (1910), (Simla).  
S. Kashmir. Simla to Hazara.

160. (99) **Trochalopteron lineatum gilgit.** *The Gilgit Streaked Laughing-Thrush.*  
*Hartert, Vog. Pal. i, p. 636 (1910), (Gilgit).*  
 Gilgit, Chitral and N. Kashmir.
161. (100) **Trochalopteron lineatum imbricatum.** *The Bhutan Streaked Laughing-Thrush.*  
*Garrulax imbricatus, Blyth, J. A. S. B. xii, p. 951 (1843), (Bhutan)*  
 Bhutan.
162. (101) **Grammatoptila striata striata.** *The Striated Laughing-Thrush.*  
*Garrulus striatus, Vigors, P. Z. S., 1830, p. 7 (Himalayas), (Naini Tal).*  
 Himalayas, from Sutlej Valley to Bhutan.
163. (102) **Grammatoptila striata austeni.** *Austen's Striated Laughing-Thrush.*  
*G. austeni, Oates, Fauna B. I. i, p. 104 (1889), (Dofla Hills).*  
 Hills North and South of the Brahmapootra.
164. (103) **Stactocichla merulina.** *The Spotted-breasted Laughing-Thrush.*  
*Garrulax merulinus, Blyth, J. A. S. B. xx, p. 521 (1851), (Manipur).*  
 Hills South of Brahmapootra to Looshai.
- 165.\* **Babax lanceolatus lanceolatus.** *The Chinese Babax.*  
*Pterorhinus lanceolatus, Verr., Nouv. Arch. Mus. Paris, vi, Bull., p. 36 (1871), (Chinese, Tibet).*  
 West China, Yunnan and Kachin Hills.
166. **Babax lanceolatus bonvaloti.** *The Small Tibet Babax.*  
*B. bonvaloti, Oustt., Ann. Sci. Nat. vii, p. 273 (1892), (So. Tibet).*  
 So. Tibet. "Tara in Tibet" (Hartert).
167. **Babax koslowi koslowi.** *Bianchi's Babax.*  
*Kagnakowia kozłowi, Bianchi, Bull. Ac. Peters (5), xxiii, p. 45 (1905), (Dzetschu, S. E. Tibet).*  
 South Tibet, The Watershed of the Mekong.
168. **Babax koslowi victoriae.** *The Mt. Victoria Babax.*  
*B. victoriae, Rippon, Bull. B. O. C. xv, p. 97 (1905), (Mt. Victoria).*  
 Chin Hills.

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\* I cannot separate *B. I. lanceolatus* and *B. I. yunnanensis*.



169. **Babax waddelli.** *The Giant Tibetan Babax.*  
B. waddelli, Dresser, P. Z. S. (1905) i., p. 54 (*Tsanypu*).  
South and Central Tibet.
170. (104) **Argya eari.** *The Striated Babbler.*  
Malacocercus earlii, Blyth, J. A. S. B. xiii, p. 369 (1844),  
(*Calcutta*).
171. (105) **Argya caudata caudata.** *The Common Babbler.*  
Cossyphus caudatus, Dumont, Drc. Sci. Nat. xxix,  
p. 266 (1823), (no loc.). (*Behar*).  
Practically the whole of India.
172. (105) **Argya caudata huttoni.** *The Afghan Babbler.*  
Malacocercus huttoni, Blyth, J. A. S. B. xvi, p. 476  
(1847), (*Kandahar*).  
Afghanistan, Baluchistan, Quetta.
173. (106) **Argya gularis.** *The Burmese White-throated Babbler.*  
Chatarrhoea gularis, Blyth, J. A. S. B. xxiv, p. 478 (1855),  
(*E. side of Bay of Bengal*).
174. (107) **Argya malcolmi.** *The Large Grey Babbler.*  
Timalia malcolmi, Sykes, P. Z. S., 1832, p. 88 (*Dukkun*).
175. (108) **Argya subrufa.** *The Rufous Babbler.*  
Timalia subrufa, Jerd. Madr. Jour. L. S., p. 259 (1844),  
(*Wynaad*).
176. (109) **Argya longirostris.** *The Slender-billed Babbler.*  
Pyctorhis longirostris, (Hodg.) Moore, P. Z. S., 1854,  
p. 104 (*Nepal*).
177. (110) **Turdoides terricolor terricolor.** *The Bengal Babbler.*  
Pastor terricolor, Hodg., J. A. S. B. v, p. 771 (1836)  
(*Nepal*).  
N. India from Sind to Bengal.
178. (110) **Turdoides terricolor malabaricus.** *The Southern Indian Jungle Babbler.*  
Malacocercus malabaricus, Jerd., B. of I. ii, p. 62  
(1877), (*Malabar*).  
South India from Orissa to Bombay.
179. (110) **Turdoides terricolor sindianus.** *The Sind Babbler.*  
Ticehurst Bull. B. O. C., Vol. xl, No. ccli, p. 156 (1920)  
(*Karachi, Sind*).  
Sind, Mt. Aboo, Punjab.

180. (111) **Turdoides griseus griseus.** *The White-headed Babbler.*  
Turdus griseus. *Gm., Sys. Nat. i*, p. 824 (1788), (*Carnatic*).  
South India E. as far North as Ellore and Belgaum.
181. (112) **Turdoides griseus striatus.** *The Ceylon Babbler.*  
Malacocercus striatus, *Swains, Zool. Ill.*, p. 127 (1831),  
(*Ceylon*).  
Ceylon only.
182. (113) **Turdoides griseus somervillei.** *The Bombay Babbler.*  
Timalia somervillii, *Sykes, P. Z. S.*, 1832, p. 88 (*Bombay*).  
Travancore to Bombay on the West Coast.
183. (114) **Turdoides rufescens.** *The Ceylon Rufous Babbler.*  
Malacocercus rufescens, *Blyth, J. A. S. B. xvi.*, p. 453  
(1847), (*Ceylon*).

(To be continued.)



## SCIENTIFIC RESULTS FROM THE MAMMAL SURVEY.

## No. XXIII.

By

OLDFIELD THOMAS, F.R.S.

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## A NEW BAT OF THE GENUS MYOTIS FROM SIKKIM.

In Mr. Wroughton's Report No. 26, on Darjiling Mammals, a note by me is published (Journ. B. N. H. S., xxiv, p. 779, 1916) on two specimens of *Myotis sicarius*, with a comment that one of them is a good deal smaller than the other, with specially smaller teeth.

We have now received from the Bombay Society two further specimens of this group, male and female, and both of them precisely agree with that smaller specimen, and as both sexes are represented I cannot but consider that the series includes two species, of which one needs description as new.

Although the first discovery was made by Mr. Baptista, it is to the two recent specimens that the clearing up of the confusion is due, and as the Society owes them to Mr. C. Primrose, I take the liberty of forming the specific name as follows:—

## MYOTIS PRIMULA, sp. n.

General characters of *M. sicarius*, but smaller and with smaller teeth.

Colour and external characters apparently quite as in *sicarius*. Fur of back about 7 mm. in length. General colour above mummy-brown, the ends of the hairs glossy and rather paler. Undersurface greyish white, the bases of the hairs slaty; medium ventral area more or less tinged—perhaps stained—with yellowish.

Skull shaped as in *sicarius*, but smaller; [compare the skull measurements below with those published by Mr. Wroughton (J. B. N. H. S., Vol. XXIII, p. 608)]. Canines shorter and considerably more slender, their antero-posterior diameter in *sicarius* 1.3mm. in *primula* 1.0mm. Small premolar even smaller in proportion to the anterior one, quite internal to the tooth row. Below, this difference is accentuated, for the middle lower premolar is in *sicarius* in the tooth row and of about one-third the area in cross section of the anterior tooth, while in *primula* the two are as in the upper jaw, the middle one quite internal and only about one-tenth the area of the first.

Dimensions of the type, the starred measurements taken in the flesh.  
Forearm :—46mm.

Head and body 47\*, tail 39\*, ear 15\*, lower leg and hind foot (c. u.), 31.5.

Skull, greatest length 17.2, basi-sinual length 13.1, zygomatic breadth 11.8, interorbital breadth 4.5, breadth of brain case 8.5, palato-sinual length 7.8, front of canine to back of  $m^1$  6.9, front of  $p^4$  to back of  $m^2$  4.6, breadth across outer corners of  $m^2$  7.3.

*Hab. of type*.—Pashok, Darjiling, 3,500', of Mr. Primrose's specimens, Teesta Valley Tea Estate, 3,000'.

*Type*.—Adult male B. M. No. 16.3.25.30. Original number 500. Collected 30th July 1915 by N. A. Baptista. Presented to the National Museum by the Bombay Natural History Society.

#### No. XXIV.

#### THE MAINLAND REPRESENTATIVE OF RATUFA M. DANDOLENA.

By R. C. WROUGHTON.

Messrs. Robinson and Kloss in a "Nominal List of the SCIURIDAE, of the Oriental Region, with a list of specimens in the Collection of the Zoological Survey of India" published in the records of the Indian Museum, xv. p. 171 *et seq.* 1918, revive the name *albipes*, Blyth, for two specimens of *Ratufa*, the one from the Nilgiris and the other from the Shevaroy Hills. The recent receipt of six specimens of a *Ratufa*, collected by Mr. Stoney from "the foot of Hills to the West of Srivilliputtur," has led me to investigate the proposal to revive Blyth's name in this connection.

Blyth bases his original description on a stuffed skin and skeleton in the Calcutta Medical College, the origin of which was unknown, and which are now, it would seem, no longer available. The description commences by likening the new form to *macroura*, Pennant, *i. e.* to *macroura dandolena*, Thos. and Wrought. (cf. The Giant Squirrels of Ceylon, J. B. N. H. S., xxiv. p. 34, 1915.) and goes on to say that it is "of an uniform dull brown colour above and on the outside of the limbs down to the feet" and further "Paws whitish with black hairs intermixed upon the toes" and finally goes on to say "However the latter (*i. e.* '*macroura*' or *dandolena*) may vary the forelimbs from the elbow are invariably white, and a corresponding portion of the hind limbs. . . . I take that now described to be a particular race, equivalent to many others that are named; but the habitat remains to be ascertained."

I have now seen 8 specimens from Madura, collected by Mr. Stoney, and without exception, exactly as in *dandolena*, they have the forearm to the elbow and the lower leg to the knee white, and therefore, as Blyth points out cannot be *albipes*.

I have not of course seen the two specimens in the Indian Museum, but one of them collected by W. Daly is almost certainly conspecific with a specimen (same collector and locality) presented to the British Museum by Blanford, which in its turn is absolutely inseparable from the Madura series.

*R. albipes* was, it follows from his description, a generally brown animal, the lower half of whose face was whitish, and whose body colour extended along the limbs to the wrists and ankles, the feet being white. This clearly does not apply to either the Ceylon or the mainland *macroura* and Blyth's species can only be one of the forms of *insignis*, Miller, with which the description nearly agrees. But with which form the description is not detailed enough to decide. Under the circumstances Blyth's *albipes* might be shelved as being unrecognisable in the absence of type and type-locality.

I have carefully compared the Madura series with the large series of *dandolena* obtained by the Survey from Ceylon and I have failed to find any character in skin or skull to differentiate the members of one from those of the other, so that the island and mainland forms must both equally bear the name *Ratufa macroura dandolena*.

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## DESCRIPTION OF A NEW SNAKE OF THE GENUS ZAMENIS FROM PERSIA.

BY

G. A. BOULENGER, LL.D., D.Sc., F.R.S.

### *Zamenis hotsoni.*

Snout moderately prominent, obtuse. Eye moderately large. Rostral broader than deep, the portion visible from above measuring one-fourth or one-third its distance from the frontal; internasals as long as or a little shorter than the præfrontals; frontal broader than the supraocular, once and a half to once and two-thirds as long as broad, longer than its distance from the end of the snout, shorter than the parietals; loreal as long as deep; one præocular, not reaching the frontal, with a subocular below it; two postoculars; temporals 1 + 2; seven upper labials, third and fourth entering the eye, fourth in contact with the anterior temporal; four lower labials in contact with the anterior chin-shields; posterior chin-shields as long as or a little longer than the anterior, separated from each other by scales. Scales smooth, with a single apical pit, in 17 rows. Ventrals not angulate laterally, 196; anal divided; subcaudals 90. Pale fawn-colour or greyish above, each scale, except the outermost, with a black central shaft; head without markings; upper lip, præ- and postoculars, outer row of scales, and lower parts yellowish white.

Two specimens, the larger measuring about 500 millim. from Shiraz, presented by Major J. E. B. Hotson.

Distinguished from *Z. gemonensis* and *Z. dahlii* by the smaller eye; from the former by the single scale-pits, from the latter by the number of rows of scales on the body and the less slender form.

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## DESCRIPTION OF A NEW LAND-TORTOISE FROM NORTHERN PERSIA.

BY

G. A. BOULENGER, LL.D., D. Sc., F.R.S.

### *Testudo buxtoni*, sp. n.

Shell moderately convex, a little more than twice as long as deep the posterior border expanded, slightly reverted and feebly serrated. Nuchal shield 3 times as long as broad; supracaudal completely divided; 11 marginals on each side; vertebrals all broader than long, the third once and a half as long as broad and as broad as the corresponding costal. Plastron large, the lobes much shorter than the

width of the bridge and nearly twice as broad as long; front lobe truncate and slightly notched in front, hind lobe openly notched behind. Suture between the gular shields a little longer than that between the humerals; pectorals forming a very narrow band in the middle, their outer border about half the length of that of the abdominals, the median suture between which is as long as its distance from the anterior border of the plastron and once and one-third its distance from the anal notch; suture between the femorals shorter than that between the anals, which equals that between the humerals; axillary shield small, inguinal large. Head moderate; beak neither hooked nor notched, feebly serrated on the sides; alveolar ridge of upper jaw short and feeble; a large cordiform præfrontal shield, with a narrow shield on each side between the eye and the rhinarium, followed by a large but somewhat smaller frontal. Fore limb with 5 claws, with 4 longitudinal series of large imbricate, rounded scutes in front; a large, claw-shaped tubercle on the back of the thigh. Shell yellowish brown, with irregular and ill-defined blackish blotches; soft parts dark brown, the scutes on the fore limb blackish at the base, the claws pale horn-colour, blackish at the base.

The single specimen, stuffed, appears to be a female. Its measurements are as follows:—

Length of shell	.. .. .	280 mm.
Width " "	.. .. .	180
Depth " "	.. .. .	130
Length of plastron	.. .. .	220
" " front lobe of plastron	.. .. .	60
" " hind " "	.. .. .	65
Width of bridge	.. .. .	110
Length of head	.. .. .	48
Width " "	.. .. .	37

This Tortoise was found at Manjil, between Resht and Kasuin, South Coast of the Caspian Sea, on a hill-side about 7,000—7,500 feet, by Captain P. A. Buxton, and presented to the Bombay Natural History Museum by Capt. C. M. Ingoldby.

It is very closely related to *T. ibera*, Pall., and *T. zarudnyi*, Nikolsky, both of which are inhabitants of Persia, but it is easily distinguished from them by the divided supracaudal shield and the extremely narrow pectorals.

I am not certain whether *T. zarudnyi* deserves specific-recognition; at any rate the characters pointed out by Siebenrock (1909) are worthless. A specimen from Zirkuck, E. Persia, received from the Petrograd Museum in 1899 as *T. zarudnyi* has the first vertebral shield a little broader in front than behind, the third vertebral not broader than the third costal, and the posterior margin of the carapace not more strongly serrated than in some individuals of *T. ibera*.



## INDIAN DRAGONFLIES.

BY

MAJOR F. C. FRASER, I.M.S

(With 10 Text-figures)

(Continued from page 56 of this Volume.)

Part VIII.

Genus—THOLYMIS, Fabr.

*Tholymis*, Hagen, Stettin, ent. Ztg., 28, p. 221 (1867)—Brauer, Zool. bot. Wien, 18, pp. 365, 712 (1868)—Kirby, Trans. Zool. Soc. Lond. 12, pp. 258, 265-1889)—Calvert, Biol. C. A. Neur, pp. 199, 219 (1905-1906).

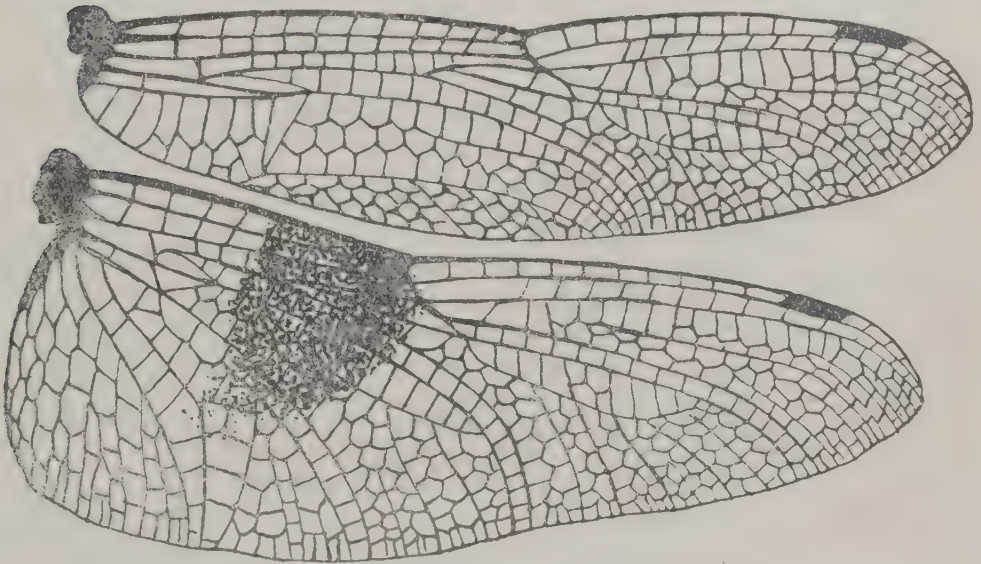


Fig. 58.—Wings of male *Tholymis tillarga* (x  $2\frac{1}{2}$ ).

Head relatively large, eyes contiguous for a long distance, rather more than the antero-posterior diameter of the occiput, forehead rounded and without prominent foreborder, suture flush, vesicle high and deeply fissured.

Prothorax with a very small posterior lobe, almost hidden by the apposition of the head with thorax.

Thorax robust, somewhat cubical and shortened. Legs slim and long, hind femora with a row of fine, gradually lengthening, sparse spines, mid femora with a similar row but fewer in number, tibial spines numerous, very fine, claw-hooks robust, situated near the middle of claws.

Abdomen dorso-ventrally swollen and less so from side to side, then tapering gradually to the end. 4th segment with a transverse ridge.

Wings moderately long and broad, rounded at the apices, reticulation very close, trigone of forewing slightly distal to the line of the trigone in the hind, traversed once, long and narrow, trigone of the hindwing at the arc, entire, its distal side slightly concave, arc between the first and second antenodal nervures, antenodal nervures  $10\frac{1}{2}$ , the final incomplete, sectors of the arc with a moderately long fusion in the forewing, a longer fusion in the hind, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all hypertrigones entire, 4th nervure markedly undulated, 2 rows of cells between 5 and 5a, 7a well formed, 8th nervure very flat and the discoidal field therefore much contracted, 3 rows of cells in the discoidal field, loop very long and very narrow, open at its apex, the inner border running straight to the termen, anal field very broad, the narrow cells composing it arranged in transverse rows. Membrane large. Stigma large, the anterior usually the same size as the posterior, but occasionally very slightly larger.



Sexual organs. See under species.

Only one species taken within Indian limits.

- 70. *Tholymis tiliarga*.**—Hagen, Stett. Ent. Ztg., 28, p. 220 (1867)—  
Brauer, Zool. bot. Wien. 18, p. 712 (1868)—  
Selys, Mitt. Mus. Dresden, 1878, p. 293.—Id.  
Ann. Mus. Civ. Genov. 14, p. 305 (1879)—Kirby,  
Trans. Zool. Soc. Lond. 12, p. 265 (1889)—Id.  
Cat. p. I (1890)—Selys, Ann. Mus. Civ. Genov. 30,  
p. 439 (1891)—Kirby, Linn. Soc. Journ., Zool. 24,  
p. 547 (1893)—Martin, Mem. Zool. France,  
9, p. 101 (1896)—Kirby, Ann. Mag. Nat. Hist. (7)  
2, p. 230 (1898)—Martin, Mem. Soc. Zool. France,  
19, p. 221 (1901)—Laidlaw, Proc. Zool. Soc. Lond.  
1902, I, p. 65—Martin, Mission Pavie (p. 4. sep.)  
(1904)—Kirby, Ann. Mag. Nat. Hist. (7) 15, p.  
271 (1908).

*Libellula bimaculata*, Desjardins, Ann. Soc. Ent. France, 4, p. IV (1835).

*Libellula pallida*, Palisot de Beauvais, Ins. Africa, America, p. 171, tab.  
2, fig. 2 (1805).

*Tholymis pallida*, Hagen, Stett. ent. Ztg. 28, p. 221 (1867)—Kirby,  
Cat. p. I (1890).

*Libellula tillarga*, Fabr. Suppl. Ent. Syst., p. 285 (1798)—Burmeister,  
Hand. Ent. 2, p. 852 (1839)—Rambur, p. 39, Neur,  
(1842)—Calvert, Trans. Amer. Soc. Ent. 25, p. 69  
(1898).

*Pantala tillarga*, Brauer, Zool. bot. Wien. 14, p. 162 (1864).

*Zygomma tillarga*, Brauer, Novara, p. 104 (1866)—Id. Zool. bot. Wien.  
17, pp. 288, 505 (1867).

Expanse 70 mm. Length 43 mm.

Male: head, eyes bright red or reddish brown above, lilaceous at the sides and beneath, occiput brown or reddish, vesicle reddish, frons and upper part of epistome reddish or bright ochreous, labrum ochreous, labium yellow.

Prothorax ochreous, no markings.

Thorax golden yellow or with a bright reddish tinge on the dorsum, paler at the sides.

Abdomen bright red or bright ochreous with a reddish suffusion along the dorsum.

Wings hyaline, the bases tinged with light golden yellow. In the hindwing a large discal spot which is most intense at the node where it abruptly ends in an almost straight border, running back for rather more than half the diameter of the wing. Inwardly it gradually fades, until lost just distal to the trigone. In the adult, external to this spot, a large, diffuse, opalescent whitish spot develops, which viewed from above in the gloaming, has a deceptively, phosphorescent appearance.

Sexual organs. Lamina depressed, slightly arched, its border shallowly notched and fringed with long yellow hairs, external tentaculæ obsolete internal very compact, triangular, the hook short and thick and turning a little outwards, lobe broad and oval.

Anal appendages long and slim, of about the length of the two final segments of abdomen.

Female: eyes brown above, olivaceous at the sides and beneath, occiput olivaceous brown, vesicle and face ochreous, paler below, labrum and labium yellow.

Prothorax and thorax, an olivaceous brown, somewhat greenish at the sides, legs ochreous.

Abdomen olivaceous brown.

Wings hyaline, the basal marking very obscure. The discal marking only just visible and without the opalescent outer marking. Stigma, as in the male, reddish brown.

Sexual organs: border of the 8th segment not dilated. 8th segment

split into two leaf-like, triangular processes; 9th ventral plate prolonged as a tongue-like process, extending to the end of the 10th segment. This process strongly carinated and furnished at its base with two small hooks.

*Hab.*—Throughout India, Ceylon, Burma, Thibet, Indo-Malaysia and Indo-China.

This insect is one of our few night-flying dragonflies. Occasionally it may be seen flying in the day-time in shady groves or dark jungles, but usually it prefers to wait for sundown, at which time it quite suddenly appears in great numbers, flying low over water. Of great interest is the opalescent patch on the hindwings of the male which serves the purpose of a recognition mark for the females. After it has become too dark to distinguish the insect, the pale, lambent glow of this patch may be seen fitting like a Will-o-the-Wisp over the surface of the waters, where the insect is busily engaged hunting mosquitoes, whilst keeping one eye open for a chance female.

Genus—*ZYXOMMA*, Rambur.

*Zyxomma*, Rambur, Neur. pp 26, 30 (1842)—Hagen, Stett. Ent. Ztg., 10, p. 171 (1849)—Brauer, Zool. bot. Wien. 18, pp. 364 712 (1868)—Kirby, Trans. Zool. Soc. Lond. 12, pp. 258, 301 (1889)—Foerster, Kahr. Mannheim, 71-72 (p. 3 sep.) (1906).

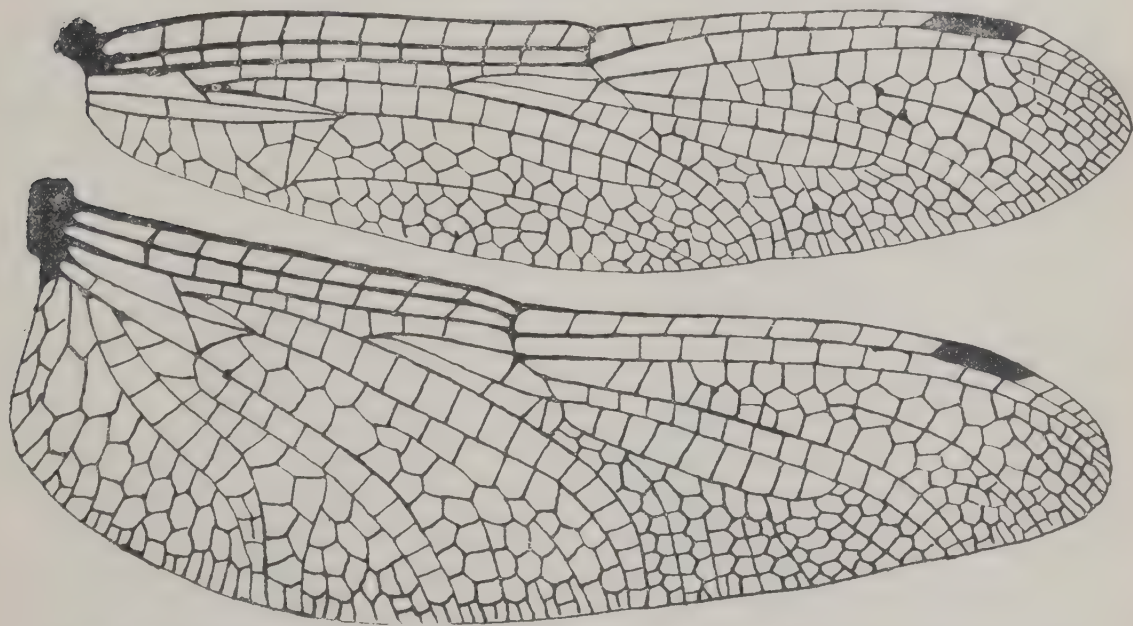


Fig. 59.—Wings of male *Zyxomma petiolatum* showing neuration (x3).

Head relatively large and globular, eyes contiguous for a very long distance and resembling those of an *Anax*, occiput very small, vesicle rounded above and overhanging the central ocellus so that this is invisible when viewed from above, forehead prominent and deeply notched in front of the ocellus, as if to give a free field of vision to the latter.

Prothorax slightly arched, very small, its posterior lobe fringed with short hairs.

Thorax small, cubical, short, coated thickly with short hairs.

Legs: hind femora with a row of very small, closely-set spines and one much larger spine at the distal end, mid femora with similar armature, tibial spines slim and numerous, claw-hooks robust, situated near the middle of the claws. Armature of the female very similar.

Abdomen very long and slim. The first 3 segments markedly tumid from side to side and ventro-dorsally, the remainder cylindrical, very slim and parallel-sided to the end. The joints of the segments markedly swollen.

Anal appendages very long and slim, nearly as long as the two last abdominal segments.

Wings long and moderately broad, reticulation close. Trigone of the forewing slightly distal to the line of that of the hind, its relation to the hypertigone about a right angle, traversed once, very narrow, trigone of



hindwing at the arc, entire, its distal side very slightly concave, sectors of the arc fused for a short distance in the forewing and for a long distance in the hind, a shorter fusion in the female, arc between the 1st and 2nd antenodal nervures, antenodal nervures  $10\frac{1}{2}$  in the male,  $11\frac{1}{2}$  in the female, the final incomplete, 1 cubital nervure to all wings, not usually supplementary nervures to the bridge but in two of my specimens there is one accessory in each right, hind-wing, 8th nervure in the hindwing from the anal angle of the trigone; in the fore, very flatly curved so that the discoidal field is contracted at the termen, discoidal field with 3 rows of cells, all hypertrigones entire, 4th nervure not noticeably undulated, 1 row of cells between 5 and 5a, anal loop long and narrow, its apex open, resembling in this respect *T. tillarga*, bifurcated cells at the outer angle only (occasionally at the trigone also), anal field broad, its cells not markedly differentiated but arranged in transverse rows. Membrane and stigma moderately large.

Sexual organs: male, lamina broad, slightly depressed, its free border bifid and furnished with two triangular processes, its surface coated with long hairs, external tentaculæ cupped, small, almost obsolete, internal tentaculæ a short, hooked spine turning strongly out and backwards, its surface furnished with minute spines, lobe quadrate, broad and short. The whole of these organs very small. Female: border of 8th segment not dilated, 8th ventral plate split for about two-thirds of its length, prolonged in to a long vulvar scale which reaches nearly to the end of the 9th segment, 9th ventral plate bent ventralwards and furnished with a tuft of black hairs.

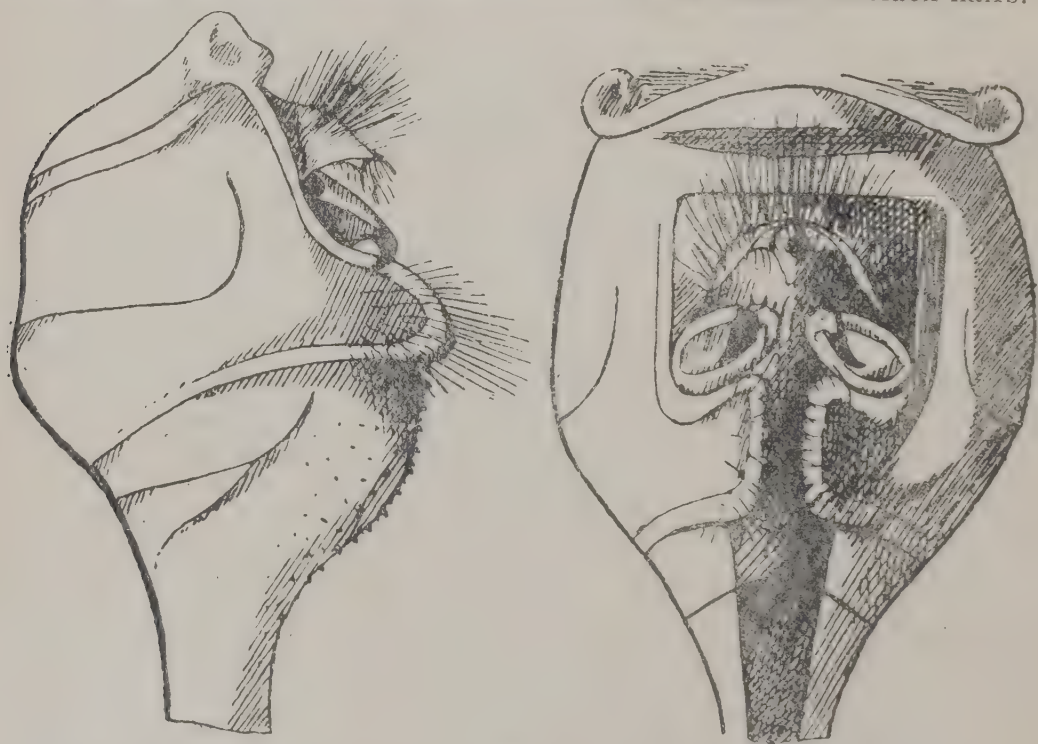


Fig. 60.—Male sexual organs of *Zygomma petiolatum* (x12).

71. *Zygomma petiolatum*, Rambur, Neur. p. 30, tab. 2, fig. 4d (1842)—Hagen, Zool. bot. Wien, 8, p. 479. (1858)—Brauer, *ibid.*, 17, p. 287 (1867)—Id., *ibid.*, 18, p. 712 (1868)—Selys, Mitt. Mus. Dresden (1878) p. 293.—Id., Comptes end. Soc. Ent. Belg., 7, VII, 88 (sep.)—Kirby, Trans. Zool. Soc. Lond. 12, p. 308, tab. 57, fig. 10. (1889)—Id., Cat. p. 335 (1890)—Selys, Ann. Mus. Civ. Genov, 30, p. 439 (1891)—Kirby, Linn. Soc. Journ. Zool. 24, p. 554 (1893)—Id., Ann. Mag. Nat. Hist. (6) 14, p. 19 (1894)—Tillyard, Proc. Zool. Soc. Lond. 1902, p. 64—Martin, Miss. Pavie (p. 7 sep.) (1904)



*Zyxomma seychellarum*, Martin, Mew. Soc. Zool. France, 9, p. 103 (1896).  
Expanse 67mm. Length 48mm.

Male and female similar.

Head: eyes rich olive green, of uniform depth above and beneath, occiput reddish brown, vesicle dark brown, epistome, frons and labrum a pale brown.

Prothorax pale brown.

Thorax pale brown, rather darker on the dorsum. No markings.

Abdomen light warm brown with moderately broad, blackish annules at the intersegmental nodes. Legs brown.

Wings hyaline or a little smoky, the apices usually but variably suffused with brown as far inwards as the middle of stigma, a brownish ray in the superior costal space not reaching the 1st antenodal nervure and a similar ray in the cubital space extending out as far as the cubital nervure. A small triangle of the same colour at the anal angle in the hind-wing. Membrane greyish black. Stigma brown.

*Hab.*—Throughout the plains of India probably as far north as the foot hills of the Himalayas. Karachi, common at the sewage farm. Bombay and Madras, Poona. This insect is another one of our night-flying dragonflies. It has a very short duration of flight, usually of not longer than half or three quarters of an hour. In Poona, specimens are seen on the wing for the first time at about 7 p.m. and go to rest at about 7-45 p.m. In Bombay they appear rather later and are seen until darkness obscures them. I have seen them on the wing on several occasions during the day-time but only in situations, where an artificial twilight reigned, such as down deep wells or actually in the precincts of buildings where they were hawking mosquitoes in the darkened corridors. Occasionally they may be put up from bushes whilst beating dense jungle. Their nocturnal habits may have some connection with the large size and uniform colouring of the eyes and also the hood-like vesicle which shades in the central ocellus and thus cuts off peripheral rays of light. Their food appears to be exclusively mosquitoes. It is a curious coincidence that the apex of the loop is open as in *Tholymis tillarga*, another night-flying species.

Genus—CAMACINIA, Kirby.

*Camacinia*, Kirby, Trans. Zool. Soc. Lond. 12, pp. 260 266 (1889)—Karsch Berlin, Ent. Zts. 33, pp. 356, 359 (1890)—Kruger, Stett. Ent. Ztg., 64, p. 253 (1903).

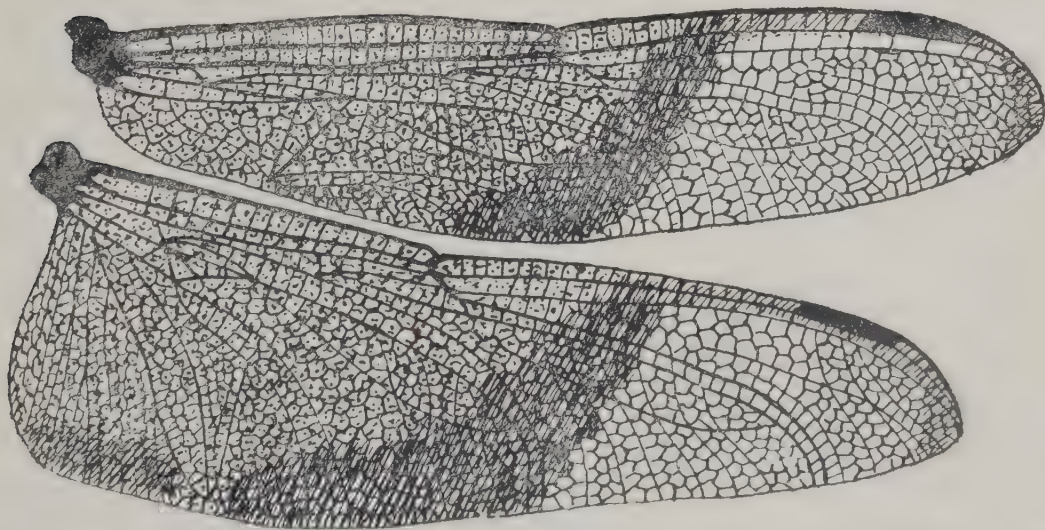


FIG. 61.—Wings of male *Camacinia gigantea*, showing neuration (x 2).

Head large and broad, the lower face projecting, bull-dog-like, forehead rounded, suture moderately deep and splitting the frons into two horse-shoe shaped, flattened areas, vesicle high and overlapping the central ocellus as in *Zyxomma*.

Prothorax with a very small posterior lobe, the free border of which is slightly fissured.

Thorax robust, deep and long. Legs robust, long, hind femora with a row of widely set, gradually lengthening spines, mid femora with a similar row of rather longer spines, tibial hairs fine and numerous, claw-hooks robust, situated about the middle of claws. Armature of the female very similar.

Abdomen short but very robust, flattened from side to side and strongly, dorso-ventrally dilated at the base tapering gradually to the anal end.

Wings long and broad, main nervures very massive, reticulation very close, due largely to a development of secondary neurulation, trigone in the forewing about 2 cells breadth distal to the line of the trigone in the hind, its costal side lengthened; traversed many times, its relation to the hypertrigone about a right angle, trigone in the hindwing traversed several times, its distal side strongly concave, situated at the arc, hypertrigone in the forewing traversed several times; in the hind, usually only once, subtrigone in the forewing prolonged proximally, traversed many times, sectors of the arc separated, but running close together for a considerable distance, arc between the 1st and 2nd antenodal nervures, 8th nervure in the hindwing at the anal angle of trigone, antenodal nervures very numerous, from 24 to 30, final antenodal, complete or incomplete, 4th nervure undulated more or less, the end steeply curved towards the termen, 1 to 4 rows of cells between 5 and 5a, 2 cubital nervures in the hindwing, 1 to 6 in fore, numerous supplementary nervures to the bridge, 8th nervure in the forewing variable, either flat or moderately curved, discoidal field variable, commencing with 2 or 3 up to many cells, either contracted or dilated at the termen, anal field very broad, loop long and narrow, the middle nervure very obtusely angled, nearly straight, filled with a close reticulation, the anal field filled with a close reticulation of secondary nervures, the cells ranged in transverse rows. Stigma large, membrane large.

Sexual organs of male very small, tentaculæ with internal and external tentaculæ. For details, see under species. Of the female, border of 8th segment not dilated, vulvar scale very small.

#### KEY TO SPECIES.

- i. 3 rows of cells between 5 and 5a, 5 to 8 rows of cells in discoidal field.  
Discoidal field contracted .. .. . *C. gigantea*.
  - ii. 1 row of cells between 5 and 5a, or a few doubled cells.  
Discoidal field beginning with a row of 4 or 5 cells and then continued as rows of 3 cells.  
Discoidal field dilated .. .. . *C. harterti*.
72. ***Camacinia gigantea***, Kirby, Trans. Zool. Soc. Lond. 12, p. 367 (1889)  
—Id, Cat, p. 2 (1890)—Karsch Ent. Nach 17, p. 42, (1891)—Kirby, Ann. Mag. Nat. Hist. (6), 14, p. 112 (1894)—Laidlaw, Proc. Zool. Soc. Lond. (1902) 1, p. 65.—Kruger, Stett. Ent. Zei. 63, p. 105 (1902)—Martin, Miss Pavie (p. 4. sep). (1904).  
*Neurothemis gigantea*, Brauer, Zool. bot. Wien, 17, p. 8 (1867)—Id., ibid., 18, p. 717 (1868)—Hagen, Stett., Ent. Zeit., 30, p. 94 (1869)—Selys, Mitt. Mus. Dresden (1878) p. 293—Id., Ann. Mus. Civ. Genov., 14, p. 292, (1879).  
Length 58 mm. Expanse 94 to 104 mm. Abdomen of female rather shorter.



Head: eyes reddish brown above, puce coloured at the sides and beneath, occiput ochreous, vesicle, frons and face brownish red, labrum and labium golden yellow.

Prothorax golden yellow.

Thorax reddish brown above, golden yellow at the sides. Legs bright ochreous.

Abdomen reddish brown on the dorsum, golden yellow laterally, the borders dark reddish brown and the distal borders of segments dark brown.

Wings rich golden yellow from the base to a little more than halfway between the node and stigma, from which point it slopes steeply back to reach the termen at the 6th nervure. The outer borders of this basal area suffused broadly with brown as far as the tornus, but with an interruption at the apex of the loop in the hindwing and the whole of termen in the frontwing, from the level of the inner end of the bridge to the tornus. The area external to this hyaline, except for the extreme apices of wings which are tipped with brown and suffused with saffron for a narrow extent. Stigma reddish brown. Reticulation in the coloured area bright yellow. Discoidal field contracted in the forewing, 5 to 8 rows of cells, 3 rows of cells between 5 and 5a, 3 rows of cells between 7 and 7a, basal reticulation in the hindwing of male much closer than that in the female.

Sexual organs very small, lamina depressed, broadly arched, external tentaculæ broad and rounded, internal tentaculæ small, outwardly directed hooks, lobe very small, strongly arched and tapering.

Anal appendages as long as the 9th segment, spined beneath, ochreous.

Female very similar to the male but the coloured area in both wings, rather smaller and brighter in colour. The apices of the wings diffusely brown as far as the inner end of the stigma. In juvenile specimens, the bordering of the coloured area is merely a deeper yellow than the rest instead of brown or there may be some small diffuse spots along the hinder margin. Reticulation, especially in the basal area, much more open than in the male.

Sexual organs: border of the 8th segment not dilated, 8th ventral plate not prolonged greatly but at its end, split into small, tumid, rounded processes, 9th ventral plate tumid, broad, and furnished with two small pointed processes near its base.

*Hab.* Burma.

The formation of secondary reticulation as seen in this insect and in species of *Neurothemis*, etc., is evidently due to sexual selection, as it is much more pronounced in the male than in the female. I do not think that sufficient stress has been laid on the influence of this factor, the study of which may throw considerable light on several anomalies in the neuration map of the dragonflies wing. In these species, we find two influences warring against each other, one tending to simplify the neuration by reduction and the other tending to complicate and increase it. The construction of a colour scheme in which the basis is a network of fine golden or crimson threads can only be brought about by an increase in the neuration.

**73. *Camacinia harterti***, Karsch, Berlin Ent. Zthr., 33, p. 359 (1890)—Kirby, Cat., p. 177 (1890)—Kruger, Stett. Ent. Ztg., 63, p. 107 (1902).

*Camacinia harmandi*, Martin, Bull. Mus. Hist. Nat., 1900, p. 103—Id., Miss. Pavie (p. 4 sep.) (1904)—Id., Bull. Soc. Ent. Ital. 60, p. 196 (1908).

Expanse 90 to 95 mm. Length 44 to 48 mm.

Head: eyes reddish brown above, paler at the sides and beneath, vesicle, frons and upper epistome reddish brown, labrum and labium ochreous, somewhat darker over the lateral lobes, occiput brown.



Prothorax ochreous.

Thorax reddish or golden brown with a coppery iridescence, paler at the sides. Legs dark brown, coxæ and base of femora ochreous.

Abdomen ochreous, the borders dark brown or blackish.

Wings hyaline, base of forewing golden yellow to a little distal of the trigone, and black rays in the inferior intercostal and cubital spaces, base of hindwing golden yellow as far out as 4 or cells distal of the trigone and black rays in the same spaces as in the forewing, extending respectively as far as the 1st antenodal nervure and the distal end of trigone, reticulation at the base very close and compact, extending into loop and proximal end of discoidal field,  $17\frac{1}{2}$  or 17 antenodal nervures, the end being either complete or incomplete, 1 cubital nervure in the forewing 2 in the hind, 1 or 2 accessory nervures to the bridge, only 1 row of cells between 5 and 5a, or a few doubled cells, the discoidal field considerably dilated, 4 or 5 cells at the trigone, followed by 2 or 3 rows of cells for a long distance.

Sexual organs: lamina depressed, the border curling a little outwards and slightly notched, external tentaculæ directed out and back, broad and rounded, internal tentaculæ moderately long and slightly curled hooks, lobe small and linear.

Anal appendages as long as the 9th segment, ochreous.

Female very similar to the male, but rather paler in colour. Wings at the base reticulated rather more than in the male, extending into the outer angle of the loop and for a longish piece of the discoidal field. The dark rays less extensive, the reticulation at the base, bright yellow. The outer half of the wings smoky, especially along the borders and at the apex.

Stigma dark brown. Membrane grey.

Sexual organs: border of 8th segment not dilated, vulvar scale very small, split distally into two roundish processes.

Hab.—Bengal, Sikkim.

#### Genus.—ÆTHRIAMANTHA.

- Æthriamantha*, Kirby, Trans. Zool. Soc. Lond. 12, pp. 262, 283 (1889)—Karsch, Berlin Ent. Zthr., 33, p. 376 (1890)—Selys, Ann. Soc. Ent. Belg., 41, p. 81 (1897)—Forster, Jahr. Mannheim, 71-72 (p. 1: sep.) (1906).  
*Dicranopyga*, Karsch, Berlin Ent. Zthr., 33, pp. 282, 356 (1890).

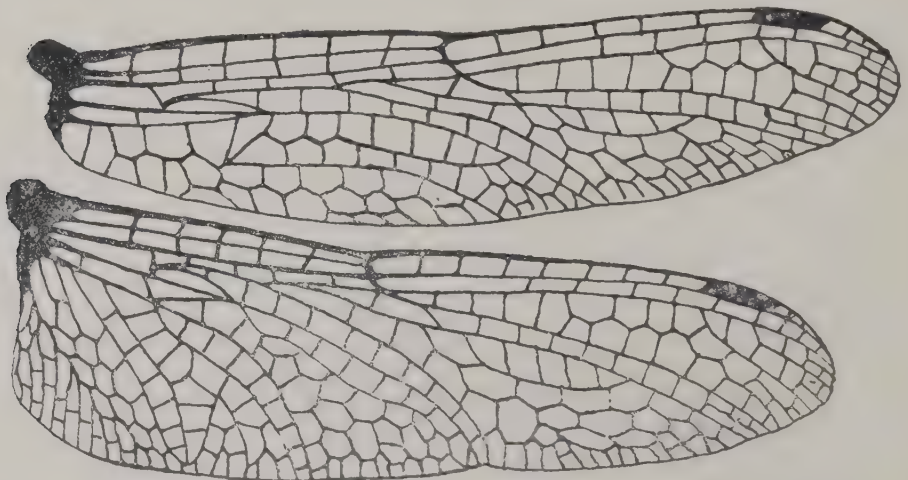


Fig. 62.—Wings of *Æthriamantha brevipennis* showing neurulation (x 3).

Head relatively small, eyes contiguous for a considerable extent, forehead rounded, with no definite foreborder, vesicle prominent, suture deep.

Prothorax with a small, rounded, hidden lobe.

Thorax long and narrow. Legs long and narrow, hind femora with a row of widely-set, short spines and a few slightly longer ones at the distal end, mid femora with a row of gradually lengthening spines, tibial spines long and numerous, claw hooks robust, situated just distal of the middle of claws.

Abdomen relatively broad and rather short, somewhat depressed in the male, cylindrical in the female, tapering to the end in the male, more parallel sided in the female.

Wings short and broad, reticulation very open and indistinct, trigone in the forewing just distal to the line of the trigone in the hind, entire, very broad, the costal and proximal sides being subequal, its relation to the hypertrigone rather more than a right angle, trigone in the hindwing at the arc, entire, arc between the 1st and 2nd antenodal nervures, its sectors separated in the forewing and joined for but a short distance in the hind, 8th nervure arising from the anal angle of the trigone, or slightly separated, 6 antenodal nervures, the end one complete, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all hypertrigones entire., 4th nervure in the forewing with a very flat convexity, 1 row of cells between 5 and 5a, 8th nervure in the forewing short, strongly curved, 2 rows of cells in the discoidal field, the latter dilated at the termen, loop moderately short and straight, its mid-rib nearly straight, no divided cells at the trigone but occasionally some at the outer angle, cells in the anal area long and narrow, arranged in oblique rows, stigma medium sized, membrane large.

Sexual organs : male : lamina depressed, tentaculæ small, not projecting as much as the lobe, broadly triangular, the hook turning back and outwards, lobe small and rounded. Female : 8th abdominal segment not dilated, vulvar scale projecting, split into two processes.

74. *Æthriamantha brevipennis brevipennis*, Ris., Coll. Zool. Baron de Selys, Fasc. XVI, 1913.

*Libellula brevipennis*, Ramb. Neur, p. 114 (1842).

*Diplacina brevipennis*, Brauer, Zool. bot. Wien, 18 p. 733 (1868).

*Æthriamantha brevipennis*, Kirby, Trans. Zool. Soc. Lond. 12, p. 283, tab. 53, fig. 3 (1889)—Id., Cat., p. 24 (1890)—Selys, Ann. Ent. Soc. Belg., 41, 82. (1897)—Ris, Jena, Denkschr., 13, p. 346 (1908).

*Urothemis brevipennis*, Selys. Ann. Mus. civ. Genov. 30, p. 468 (1891).

Expanse 54 mm. Length 30 mm.

Male : eyes reddish above, lilaceous at the sides and beneath : face and epistome ochreous : vesicle yellow : occiput olivaceous.

Prothorax pale brown.

Thorax reddish brown, no marking. Legs black, the hind femora having a bright crimson spot at the base.

Wings hyaline with the extreme base a light golden yellow, this colour extending out as far as the 1st antenodal nervure, the cubital nervure, and for a few cells in the anal field adjacent to the membrane, in the hindwing, the extent of this colour is rather more, going beyond the 1st antenodal nervure but not reaching the arc or the trigone. There are also some dark brown rays in the intercostal and cubital spaces and a spot in the anal field. Stigma reddish brown.

Abdomen red on the dorsum, ochreous or yellow at the borders.



Anal appendages ochreous, the superior small, narrow and furnished with some small spines, the inferior slightly smaller.

Female very similar to the male but the eyes olivaceous brown above and the body ochreous or dull yellow. No reddish colour on the abdomen.

*Hab.*—This insect has been reported from Bengal, Upper Burma and Ceylon. Barkuda Island, Chilka Lake, Ganjam.

It appears to be widely distributed, but uncommon.

Genus—UROTHEMIS.

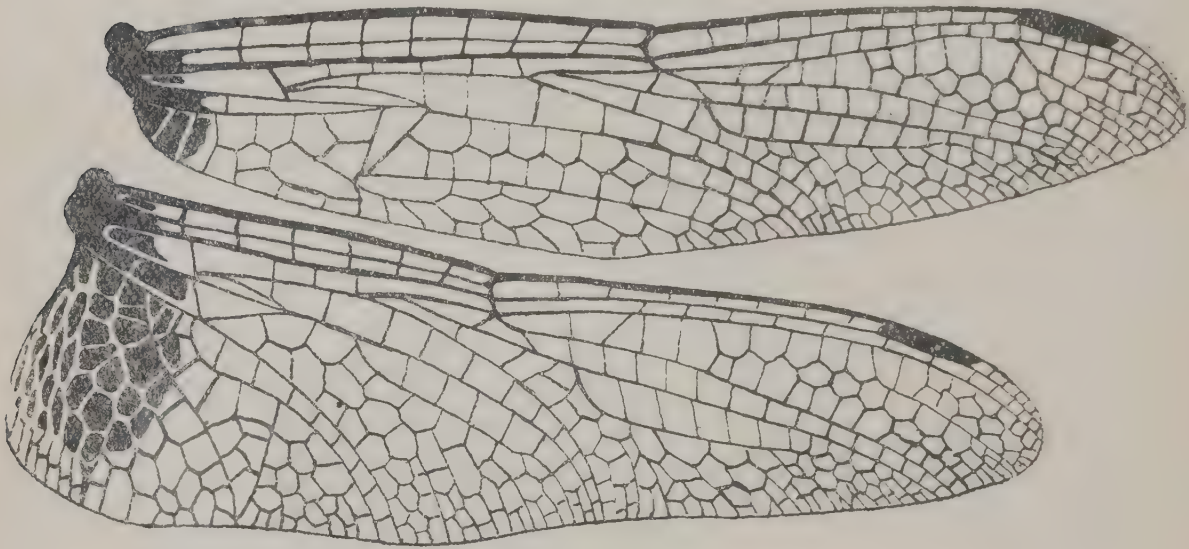


FIG. 63.—Wings of *Urothemis signata signata* (x 3).

Genus *Urothemis*, Brauer, Zool. bot. Wien. 18, pp. 175, 368, 737 (1868), Kirby Trans. Zool. Soc. Lond., 12, pp. 262, 282 (1889), Kasch, Selys and Forster, Ris. Coll. Zool. du Selys p. 1016, Fasc. XVI (1913).

Head large, eyes broadly contiguous, somewhat longer than the occiput from before back, forehead without any marked foreborder and split by a very deep suture into two rounded eminences, vesicle high, but slightly notched, occiput small.

Prothorax with a small posterior lobe.

Thorax robust, somewhat cubical. Legs moderately long and slim, hind femora with a row of very small, closely set spines and a single longer one at the end, mid femora with a row of longer, less numerous, more widely set and gradually lengthening spines which reach to the end of the femur, tibial spines numerous, long and slim, more numerous in the fore and mid-femora than in the hind, claw hooks robust, situated near the end of the claws. Armature of the female very similar.

Wings long and moderately broad, especially the hind, reticulation close, trigone in the forewing slightly distal to the trigone in the hind, costal side of trigone in the forewing about half the length of the proximal, relation of the trigone to hypertrigone slightly less than a right angle, trigone in the hindwing at the arc, arc between the 1st and 2nd antenodal nervures, its sectors separated in the forewing but fused for a moderate distance in the hind, 8th nervure arising from the anal angle of the trigone in the hindwing, 7 antenodal nervures, the final complete, the distance

between the 1st and 2nd nervures greater than the following, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all hypertrigones entire, 4th nervure slightly undulated, 1 row of cells between 5 and 5a, 8th nervure in the forewing very flat, 2 rows of cells in the discoidal field, sides of latter parallel, the end of field a little contracted or dilated, loop short and straight, its mid-rib nearly straight, divided cells at the outer angle and trigone, cells in the anal area split into an outer area of moderately large cells arranged in oblique rows and an inner area of narrow, longish cells arranged in transverse rows, stigma and membrane moderately large.

Abdomen moderately short, broad and depressed, slightly constricted at the 3rd segment, more or less fusiform in the male, the sides parallel sided in the female, the 4th segment without ridges.

Sexual organs: male: lamina depressed, small, external tentaculæ obsolete, internal tentaculæ triangular, with a broad base and an almost straight hook, which is less projecting than the lobe, lobe small, oval or pointed. Female: border of the 8th abdominal segment not dilated, 8th ventral plate longer than broad, projecting markedly and prolonged as a tubular vulvar scale nearly to the end of the 9th ventral plate, split for the greater part of its length, 9th ventral plate prolonged into a notched, tongue-like process, 10th segment very small.

Only one species found within Indian limits.

**75. *Urothemis signata signata*,** Ris, Coll. Zool. du. Selys, p. 1016, Fase. XVI (1913).

*Libellula sanguinea*, Burm. Handbk. Ent. 2, p. 858 (1859)—Hagen, Zool. bot. Wien, 8, p. 480 (1858)—Calvert, Trans. Amer. Ent. Soc., 25, p. 87 (1898).

*Urothemis sanguinea*, Brauer, Zool. bot. Wien, 18, p. 737 (1868)—Kirby, Cat. p. 23 (1890)—Id., Linn. Soc. Journ. 24-p. 552 (1893)—Selys. Ann. Soc. Ent. Belg. 41, p. 75 (1897)—Martin, Mission Pavie (p. 5 sep.) (1904)—Forester Jahr. Nassau, 59, p. 316 tab. A, fig. I. (1906)—Ris, Jena. Denkr., 13, p. 344 (1908).

*Libellula signata*, Ramb. Neur., p. 117 (1842).

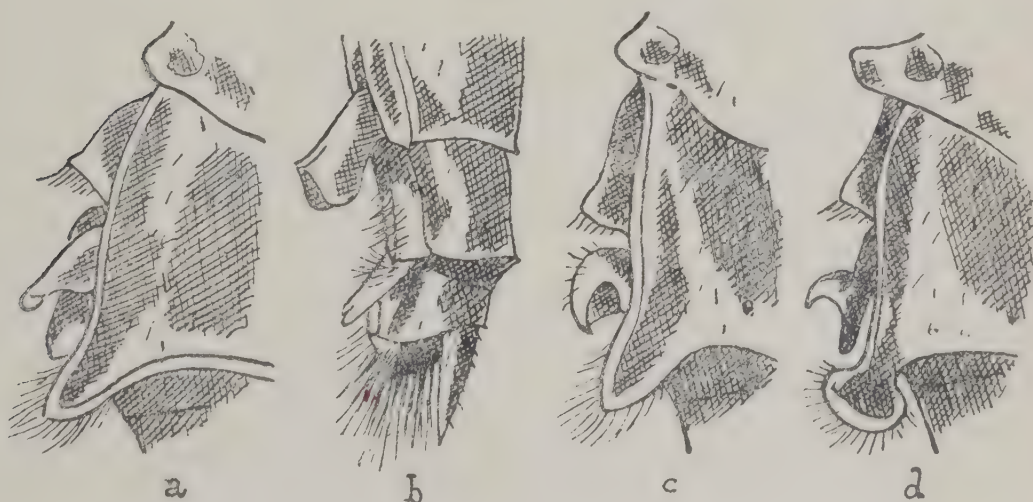


Fig. 64.—Male genital organs of—*a. Urothemis signata signata*, *c. Macrodiplex cora*, *d. Camacinia gigantea*, and Female organs of *Urothemis signata signata*.



Expanse 75 to 78 mm. Length 40 to 44 mm. Male: eyes bright, blood-red above, olivaceous at the sides and beneath, labium yellow, with dark brown borders, labrum reddish yellow, face, forehead and vesicle red with a very narrow, black, basal line to the forehead, occiput red.

Thorax reddish, golden brown, marked laterally with 3 interrupted or broken black lines.

Abdomen red marked with black, small, transversely linear, black spots on segments 4 to 7, on either side of the dorsal carina at the distal end of each segment and small, dark dorsal stripes on segments 8 and 9, expanding laterally in the distal half of segment 8 and broadening at the proximal end of segment 9.

Anal appendages ochreous. Legs black, the femora yellowish at the proximal ends of the flexor surfaces.

Wings hyaline, the extreme apices faintly smoky, a basal, amber coloured spot at the bases of both wings. In the forewing, extending halfway to 1st antenodal nervure and cubital nervure and from thence of even width to the anal border. In the hindwing this area extends as far out as the 1st antenodal and the cubital nervures. In the latter also, there are some blackish brown rays and a variably sized spot of the same colour as follows:—rays in both costal spaces extending as far as the 1st antenodal nervure and another in the cubitus extending as far as the arc, a large spot in the anal area extending from the base outwards as far as the line of the arc, its outer border curving gently to meet the base at a variable distance in front of the tornus. There is usually a small, triangular area lying between this spot and the ray in the cubital space where the wing is hyaline. The nervures in the dark spot are beautifully depicted as a golden network.

Sexual organs as for genus.

Female: head; eyes reddish brown above, olivaceous at the sides and beneath, occiput golden yellow, labrum pale yellow, labium and lower part of epistome olivaceous, vesicle and forehead bright yellow, the latter with a much better defined, black, basal line than that of the male.

Prothorax and thorax pale olivaceous at the sides or even with a greenish tinge, olivaceous brown above. An undulating, black, post-humeral line and a black line on the second lateral suture and lastly, an irregular black spot on the spiracle. Two black lines crossing the tergum between the bases of the wings.

Abdomen olivaceous or greenish yellow with diffuse, broad, blackish lines at the distal border of each segment, which coalesce at the last four segments.

Anal appendages ochreous.

Wings similar to the male but the dark spot in the anal area usually less extensive. The apices of the wings rather more extensively smoky than in the male. Stigma reddish brown with heavy, black borders.

Legs black, the anterior femora yellow on the flexor surfaces.

*Hab.*—I have specimens from Assam, Madras, Bangalore, Poona, Bombay and Ceylon. It is also reported from Bengal and should be found throughout Burma. A line drawn from about Dinapur to Bombay would probably demarcate its northern limits. It is a dragonfly of the plains, usually occurring in the moister areas and favouring swamps and shallow tanks in preference to streams and running water. It is a very active creature and difficult to capture. The female is very retiring and comparatively rare, the few specimens taken usually being found *in cop.*

Genus—MACRODIPLAX, Brauer (1868).

*Macrodiplax*, Brauer, Zool. bot. Wien., 18pp. 366, 737, (1868—Kirby Trans. Zool. Soc. Lond., 12, pp. 261, 262 (1889)—Karsch, Berlin, Ent. Zthr. 33, p. 356 (1890)—Selys, Ann. Soc. Ent. Belg., 41, p. 72 (1897).

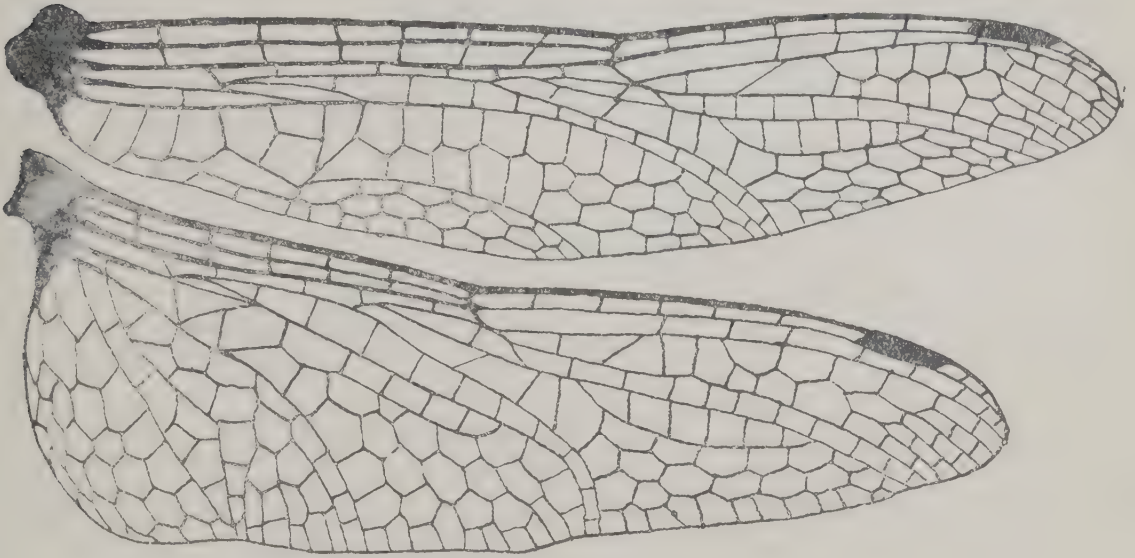


Fig. 65.—Wings of *Macrodiplax cora* (x about  $2\frac{1}{2}$ ).

Head large, eyes contiguous for a long distance, this longer than the depth of the occiput, forehead prominent and rounded, no marked fore-border, suture broad and deep, vesicle prominent and slightly notched, a distinct temporal projection at the side of the eyes. Prothorax with a very small posterior lobe which is rather hidden beneath the head, flatly arched and not fringed with hairs.

Thorax robust, somewhat cubical as in *Urothemis*. Legs long and slim, hind femora with a row of very small, evenly sized and moderately closely set spines, with a longer one at the distal end, mid-femora with a row of more widely spaced and gradually lengthening spines. Tibial spines numerous, slim and long, claw-hooks robust, situated near the end of the claws. Armature of the female very similar.

Abdomen moderately short and robust, the base dilated ventro-dorsally and laterally, a slight constriction at the 3rd segment, then depressed, fusiform and tapering towards the end. In the female the sides of the abdomen are nearly parallel. No transverse ridges to the 4th segment.

Sexual organs, *see* under species.

Wings long and broad, reticulation fairly wide, trigone in the forewing slightly distal to the line of the trigone in the hind, broad, its costal side more than half as long as the proximal and its distal side somewhat angulated outwards, relation of the trigone to the hypertrigone, a little more than a right angle, subtrigone in the forewing 2 or 3 cells, trigone in the hindwing at the arc or a little proximal, sectors of the arc in the forewing separated, in the hind fused for a variable distance, arc between the 1st and 2nd antenodal nervures, 6 to 7 antenodal nervures, the final complete, 8th nervure in the hindwing at the anal angle of trigone, 4th nervure not undulated, 1 cubital nervure to all wings, no supplementary nervures to the bridge, all trigones and hypertrigones entire, 1 row of cells between 5 and 5a, both 5a and 7a very highly developed, 8th nervure in the forewing short and very strongly convex, the discoidal



field beginning with 2 rows of cells and strongly dilated at the termen, loop with divided cells at the anal angle of trigone and at the external angle, the anal area split up into an outer area of 5 or 6 rows of large cells, not arranged distinctly in transverse rows, and an inner area more closely reticulated, of narrow cells arranged in transverse rows. Stigma small. Membrane large.

Only one species found within Indian limits.

- 76. *Macrodiplax cora***—Brauer, 18, p. 737 (1868)—Selys, Mitt. Mus. Dresden (1878), p. 294 (ex Brauer)—Id., Ann. Soc. Spain., II. (p. 15 sep.) (1882)—Id., Ann. Soc. Ent. Belg., 41, p. 72—Ris, Tijds. v. Ent., 55, p. 168 (1912).

*Diplax cora*, Brauer Zool. bot. Wien. 17, pp. 20, 289 (1867).

*Libellula lycoris*, Selys, Pollen and Van Dam, Madagas, Inn., p. 22 (1869)

Id.,—Comptes Ent. Belg., 4. v. (sep.) (1878).

*Urothemis lycoris*, Kirby, Cat. p. 24 (1890).

*Macrodiplax lycoris*, Selys, Ann. Soc. Ent. Belg., 41, p. 73 (1897)—Tillyard, Proc. Linn. Soc., New South Wales, 31, p. 484 (1906).

*Libellula nigrilabris*, Selys, Mitt. Mus. Dresden, 1878, pp. 94, 304—Kirby, Cat. p. 23 (1890).

*Urothemis vittata*, Kirby, Linn. Soc. Journ., 24, p. 552, tab. 42, fig. 2 (1893).

*Macrodiplax vittata*, Laidlaw, Proc. Zool. Soc. Lond. (1902)—Mac Lachlan, Nat. Hist. Socotra, p. 399, tab. 24 A, fig. 4, 4a (1903)—Kirby, Ann. Mag. Nat. Hist. (7), 15, p. 271 (1905).

Expanse 62 to 70 mm. Length 36 to 38 mm.

Head: eyes reddish brown above, slate coloured beneath and at the sides, vesicle pale yellow, tipped with bright pink in front, occiput reddish, face pale yellow, the upper part of the epistome suffused with red, labrum dark brown, labium pale yellow, with black borders.

Prothorax pale brown.

Thorax uniform olive brown in front, pale greenish yellow at the sides, with two irregular, black stripes laterally, the anterior of which crosses the spiracle and is incomplete in its upper half.

Legs black, all coxæ and bases of the femora yellowish on the flexor surface.

Abdomen bright reddish orange very similar to *Pantala* and with a broad middorsal, black stripe which broadens in front and behind on each segment and has a more or less diffuse border.

Anal appendages yellow or ochreous.

Wings hyaline, the base of the hind bearing a large amber, tinted spot, which extends 1 cell into the loop and to just beyond the cubital nervure. Stigma yellow, of equal size in fore and hindwings. Membrane white.

The female very similar in colour to the male, its abdomen a duller ochreous tint and the black markings narrower. The base of the abdomen, somewhat greenish.

Sexual organs: male: lamina depressed, its free border with a double notch, external tentaculæ almost obsolete, the internal a very small hook, lobe depressed and narrow.

Female: border of 8th abdominal segment not dilated, the end of the 8th ventral plate prolonged into a small, somewhat projecting vulvar scale, flat and convex, overlapping the 9th segment but slightly. 9th ventral plate furnished with two small, widely diverging hooks about its middle, the 10th segment prolonged into a short, blunt projection.

*Hab.*—Ceylon and Southern India. I have taken this species in Madras, but it is not common and very difficult to distinguish from *Pantala flavescens* when on the wing. It is somewhat smaller than the latter insect, but resembles it closely otherwise. It frequents open situations such as grassy commons or hovers over low scrub. I have never seen it over water.

In the key to the genera of the Libellulinæ on page 618, Vol. XXV, No. 4 of the Journal, Natural History Society, Bombay, I wrongly described *Macrodiplax* as "dull coloured," the descriptions having been made from faded specimens. Since then also, I have decided to include a Mesopotamian species, viz., *Selysiothemis nigra*, and so now make the following alterations to the key:—In line 4, "3 cells" should be altered to "2 or 3 cells," and all below that line, in the key, should be deleted and the following substituted:—

X. Only 6 antenodal nervures.

x<sup>1</sup> Neurulation of wing greyish white and almost invisible. Stigma bicolourous.

Discoidal field but slightly dilated.. .. *Selysiothemis*.

x<sup>2</sup> Neurulation of wing black and distinct. Stigma unicolourous.

Discoidal field widely dilated .. .. *Macrodiplax*.

Y. Nearly constantly 7 antenodal nervures.

Discoidal field, but slightly dilated .. .. *Urothemis*.

Genus—SELYSIOTHEMIS.

*Selysiothemis*, Ris, Ann. Soc. Ent. Belg., 41, p. 47 (1897)—Selys, *ibid.*, p. 70 (1897).

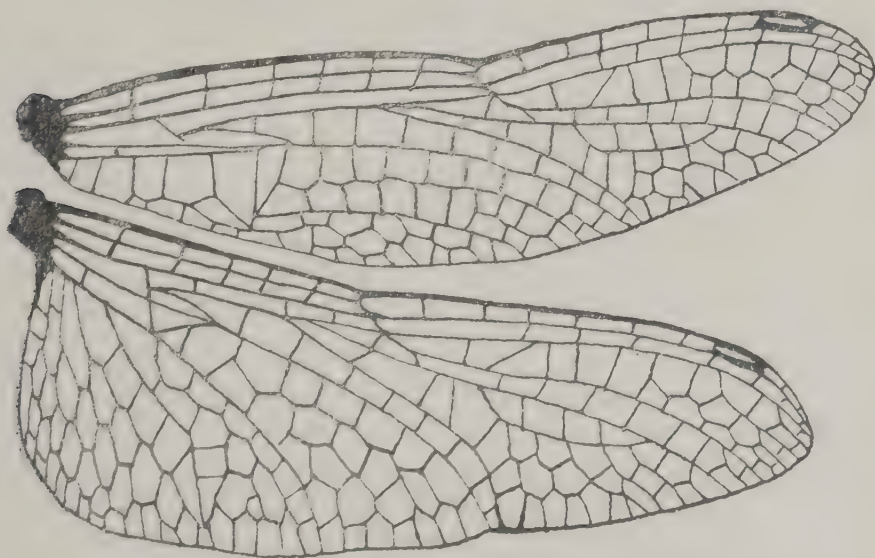


Fig. 66.—Wings of *Selysiothemis nigra* (x 3).

Head large; eyes broadly contiguous, the optic suture longer than the occipital triangle; no distinct temporal projection to the eyes as in *Macrodiplax*, only a slightly arched projection; forehead without a sharp foreborder, a little flattened in front; suture deep; vesicle large, broadly arched and rounded.

Prothorax with a small posterior lobe, depressed and spherically arched.

Thorax narrow. Legs long and tolerably slim. Male; hind femora with a row of very closely set and very small spines; mid-femora with ca. 10



moderately robust spines. Female: hind femora with a row of gradually lengthening spines in the distal third; mid femora with a row of spines which are very short in the proximal half and lengthening gradually in the distal half. Tibial spines moderately long, very slim. Claw-hooks long, slightly distal to the middle.

Abdomen moderately short, the base very slightly tumid, slightly constricted at the 3rd segment, then slim and cylindrical to the end, 4th segment without a transverse ridge.

Wings broad, reticulation wide; trigone in the forewing about 1 cell distal to the line of the trigone in the hind; arc between the 1st and 2nd antenodal nervures; sectors of the arc in the forewing separated,

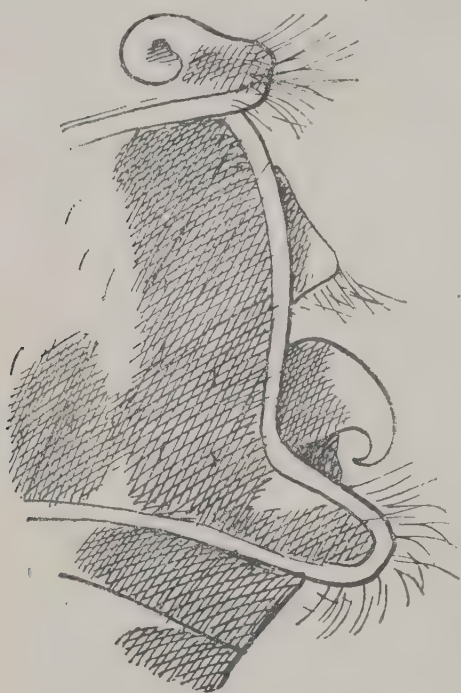


Fig. 67.—Male sexual organs of *Selysiotthemis nigra*.

in the hind fused for a short distance; antenodal nervures 5-6, the last incomplete, the distance between the 1st and 2nd considerably greater than between the others; 8th nervure in the hindwing at the anal angle of the trigone; 1 cubital nervure to all wings; no supplementary nervures to the bridge: trigone in the forewing free, broad, the costal side rather more than half of the proximal, the distal side strongly angulated at the point where the nervure dividing the first discoidal cells joins it; relation of the trigone to the hypertrigone rather more than a right angle; trigone in the hindwing free, slightly proximal to the arc, its costal side bent back slightly at the distal end; 1 row of cells between 5 and 5a; 4th nervure with but a slight convexity; 8th nervure in the forewing short and strongly curved; 7a well formed; 2 rows of cells in the discoidal field, the latter moderately dilated at the termen; loop extending about 1 cell beyond the outer angle of the trigone, its apex very blunt, only occasional divided cells at the outer angle and none at the trigone. its midrib very straight; a supplementary nervure springing from the inner border of the loop, but the differentiation of cells in the anal field by no means distinct. Stigma very small, indistinct. Membrane relatively large.

Sexual organs of the male without any external tentacule. The female with a very small, vulvar scale.

77. *Selysiotthemis nigra*, Ris, Ann. Soc. Ent. Belg., 41, p. 48 (1897)—Seyles, *ibid*, p. 71 (1897)—Bartenef Ann. Mus. Zool. Acad. Imp. St. Petersburg, 16, p. 411 (1912)—*Id.*, Mid Caucasus, Mus., 7, p. 108 (1912).

*Libellula nigra*, Van der Lind, Monog., p. 16 (1825)—Selys, Monog., pp. 29, 55, 209 (1840)—Hagen, Syn. Lib. Eur., p. 37 (1848)—Ramb. neur. p. 118 (1842)—Selys-Hagen Revue, des Odonates, p. 65 (1850).

*Urothemis nigra*, Selys, Comptes rendus Soc. Ent. Belg., 4 v. (sep.) (1878)—*Id.*, Ann. Soc. Ent. Belg., 31, p. 77 (1887)—Kirby, Cat. p. 23 (1890).

*Trithemis nigra*, Brauer, Zool. bot. Wien, 18, p. 736 (1868).

*Urothemis advena*, Selys, Comptes rendus Soc. Ent. Belg., 4. v. (sep.) (1878)—Id., Ann. Soc. Ent. Belg., 31, p. 69 (1887)  
—Kirby, Cat. p. 24 (1890).

Expanse 52 mm. Length 30 mm. Hindwing 25 mm. Abdomen 20 mm.

Male: head: eyes blackish brown above, paler or lilaceous at the sides and beneath, in teneral specimens the eyes are dark ochreous and paler beneath and with a purplish tinge, the females are always of this colour, labrum ochreous, labium, and lower part of face pale olivaceous, upper part of face and forehead with some blackish. In teneral specimens, the labrum is pale yellow and the rest of the face and forehead is a waxy white, as is also the vesicle. In adult specimens a dark band develops on the forehead and is prolonged down at the sides of the eyes and the vesicle becomes dark olivaceous.

Prothorax and thorax black in the adult, the ventral side more or less pruinulent, in teneral specimens they are of a waxy white with obscure brown mid dorsal, humeral and lateral lines. The legs are straw coloured on the flexor surfaces and blackish brown on the extensor but in the adult they become wholly black. The bases of the femora yellowish.

Abdomen black in the adult with the ventrum pruinulent. In the teneral condition a waxy white with blackish brown markings on the dorsum. These markings diffuse, broadening apically and more extensive on the anal segments. In the last few segments, a prolongation of the brown goes forward from the distal end of the segments laterally, to enclose a spot of the ground colour. The last 3 segments are almost entirely brown on the dorsum.

Anal appendages yellowish or white, the superior strongly curved downward and equal in length to the inferior.

Wings peculiarly invisible owing to the venuration being a pale or dirty white in colour. The stigma is bordered in front and behind with well-defined black, the intervening part is almost translucent or slightly opalescent.

Female: very similar to the teneral male, but the brownish markings on the thorax almost obsolete and the black markings of the abdomen replaced by bright ochreous. Legs paler. Wings similar to the male.

Sexual organs: male: lamina depressed, fissured and furnished with short hairs; tentaculæ short, triangular and the apex prolonged into a recurved hood. The external tentacula represented only by a small protuberance.

Lobe square. Female: border of 8th segment not dilated; the vulvar scale very small, depressed. Appendages small, white or creamy.

*Hab.*—Lower Mesopotamia and Persian Gulf. Bushire. Very few specimens appear to have found their way into collector's hands before the war, a surprising fact when one considers how very common an insect it is in its native country. I have seen it in countless swarms at Basra and the lower Shat-el-Arab whilst it frequently takes to the sea and may be seen in great numbers coming aboard steamers trafficking in the Gulf. I saw one such swarm come on board the Ambulance Transport *VARSOVA* on 19th August 1919, quite one hundred miles south of the bar of the Shat-el-Arab, but at the end of the same month not a single specimen was to be seen on land at Basra. I saw a similar swarm in 1917 on board a ship a few miles south of the Shat-el-Arab, all of which were teneral specimens. It is quite possible that this species will eventually establish itself in Sind and North-West India.

On land it has habits similar to *Diplacodes* and is always found settling on the ground or low shrubs. Barren, open desert lands appear to be preferred.

(To be continued.)



THE FLORA OF THE INDIAN DESERT.  
(JODHPUR AND JAISALMER.)

BY

E. BLATTER, S.J., AND PROF. F. HALLBERG.

PART VI.

*With 3 plates.*

*(Continued from page 47 of this Volume.)*

PART II.

ECOLOGICAL NOTES.

1. METEOROLOGY.

The Indian Desert forms the east end of the greatest desert district of the world, extending from the Atlantic coast of Africa and including the Sahara, part of Arabia, S. Persia and Baluchistan.

The climate of our region is characterised by excessive drought, the rainfall being scanty and irregular. The winter rains of Northern India rarely penetrate into the region, and there is thus only one rainy season: that of the south-west monsoon.

We give a list of meteorological data, obtained from the Government Observatory, Colaba.

A few remarks are necessary to show the extreme irregularity of the rainfall. The year 1917 was a record year, during which about three times as much rain fell as the statistics of about forty years would lead one to expect. On the other hand, not a single cent was registered at either Khabha or Ramgarh, Jaisalmer State, in 1899. During the year in question 26 cents was received at Jaisalmer, and the whole of this in April. In August 1881 ten inches fell in a single day at Jodhpur.

The cold season—from about the middle of November to the middle of March—is characterised by extreme variations of temperature, and the temperature is frequently below freezing point at night. During April, May and June the heat is intense and trying, and scorching winds prevail with great violence, sand-storms with great desiccating action being frequent. The relative humidity of the atmosphere is always low.

The meteorological conditions during our tour were very unusual, and for this reason we think it worth while giving our observations in detail, in spite of their fragmentary nature. We were held up for several days at Bhikamkor on account of the Jodhpur-Phalodi railway line having been washed away in places by the rain.

In general, the region possesses a healthy climate, except during the period after the rains. As was to be expected, the year 1917 was particularly bad in this respect. At the time of our visit, practically the entire population was suffering from malaria.



A.—At Loharki. To the right : Dune (invading the plain) with *Aerua* sp. To the left : *Crotalaria burhia*. Along edge of dune and in the centre : *Calotropis procera*. In the background Loharki village with cultivated trees.



B.—Two miles west of Jaisalmer town. *Crotalaria burhia*, *Calotropis procera*.—Herd of cattle.





*Meteorological Data.*

Stations.	(1) MEAN MAXIMUM TEMPERATURE.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Jodhpur ..	76.1	80.0	91.1	100.7	106.5	104.6	97.7	93.3	94.9	96.9	89.7	79.7	92.6
Pachbhadra ..	78.4	83.2	94.6	106.3	107.8	105.7	97.7	94.8	97.2	98.7	90.7	81.5	94.7

Stations.	(2) MEAN MINIMUM TEMPERATURE.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Jodhpur ..	49.6	53.0	62.9	72.6	80.2	82.7	80.5	78.0	75.5	67.5	58.5	52.7	67.8
Pachbhadra ..	45.1	48.9	58.3	69.6	77.5	81.1	79.7	77.3	75.2	64.9	54.1	46.3	64.9

Stations.	(3) MEAN RELATIVE HUMIDITY OF THE AIR.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Jodhpur ..	46.1	33.1	33.7	34.3	42.7	52.4	66.8	70.1	64.5	46.2	38.1	42.9	48.1
Pachbhadra ..	46.1	33.1	33.7	34.3	42.7	52.4	66.8	70.1	64.5	46.2	38.1	42.9	48.1

Stations.	(4) MEAN RAINFALL.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
Jaisalmer ..	0.21	0.20	0.15	0.13	0.22	0.69	2.17	2.28	0.83	0.01	0.04	0.07	7.00
Barmer ..	0.11	0.14	0.07	0.05	0.32	1.22	3.51	3.13	1.52	0.02	0.08	0.05	10.22
Pachbhadra ..	0.23	0.15	0.10	0.08	0.51	1.28	3.64	3.71	2.02	0.05	0.06	0.10	11.96
Jodhpur ..	0.17	0.22	0.06	0.14	0.25	1.23	4.21	4.31	2.40	0.11	0.10	0.14	13.34
Phalodi ..	0.15	0.23	0.13	0.08	0.21	1.06	3.04	3.16	0.78	0.00	0.02	0.09	8.95



## Meteorological Data—contd.

Stations	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
(5) MEAN NUMBER OF RAINY DAYS.													
Jaisalmer	0.6	0.7	0.4	0.3	0.6	1.3	3.7	3.7	1.4	0.0	0.1	0.2	13.0
Barmer	0.5	0.3	0.2	0.2	0.5	1.8	4.3	4.0	2.3	0.1	0.2	0.2	14.6
Pachbhadra	0.7	0.5	0.3	0.3	0.9	2.1	5.2	4.9	2.4	0.2	0.2	0.3	18.0
Jodhpur	0.5	0.6	0.2	0.5	0.7	1.9	5.0	5.7	2.5	0.2	0.2	0.5	18.5
Phalodi	0.7	0.5	0.4	0.1	0.5	1.7	3.7	4.4	1.2	0.0	0.0	0.2	13.4
(6) ACTUAL RAINFALL FOR 1917.													
Jaisalmer	0.00	0.00	0.00	1.33	1.73	2.17	0.60	8.44	7.73	0.62	0.00	0.02	22.64
Barmer	0.00	0.00	0.30	0.20	1.24	1.64	7.01	6.21	4.20	2.70	0.00	0.00	23.50
Pachbhadra	0.00	0.00	0.00	0.10	3.07	6.50	8.08	5.19	3.88	5.00	0.00	0.00	31.82
Jodhpur	0.04	0.20	0.10	1.12	4.15	4.75	5.78	14.20	5.74	6.02	0.00	0.25	42.35
Phalodi	0.00	0.00	0.00	1.79	2.41	1.74	0.30	10.24	6.50	2.70	0.00	0.00	25.68
(7) NUMBER OF RAINY DAYS, 1917.													
Jaisalmer	0	0	0	3	3	2	3	13	9	1	0	0	34
Barmer	0	0	1	1	2	3	3	10	7	2	0	0	29
Pachbhadra	0	0	0	1	5	5	4	4	6	1	0	0	26
Jodhpur	0	1	1	4	6	2	5	10	14	3	0	1	47
Phalodi	0	0	0	4	4	4	1	14	8	1	0	0	36

Place of Obs.	Date.	Time of Obs.	Bar. Pressure (uncorrected.)	Temperature.			Wind.	
				Dry Bulb.	Wet Bulb.	Min.	Max.	Dir. Vel.
Jodhpur ..	Oct. 19	7.0	740.7	63.0	59.1	61.5	..	
		14.40	740.5	87.3	67.5	..	..	
	20	20.0	740.7	77.8	66.7	..	87.5	
		6.15	742.0	61.5	57.1	57.0	..	
	21	20.0	740.5	71.1	61.6	..	88.0	
Balarwa ..	23	7.0	742.1	59.8	54.5	56.0	..	
		14.15	740.2	85.7	66.3	..	..	
	24	8.0	737.0	71.0	63.0	..	..	
Osian ..	25	6.0	736.2	67.8	60.5	62.0	..	
		8.45	731.3	71.0	63.0	..	..	
		12.45	729.7	85.5	73.0	..	..	
Bhikamkor ..	25	20.15		73.0	66.5	..	..	
		6.30	729.2	65.4	64.3	62.0	..	E 3
	26	13.0	730.0	67.5	65.5	..	..	..
		17.45	729.0	67.0	65.0	..	..	NE 5
	26	7.15	724.5	64.1	63.0	..	..	NNE 3
		14.15	725.7	67.6	66.3	..	..	N 3
		17.35	726.7	65.7	64.4	..	..	N 2
27	27	7.0	728.7	64.3	63.7	58.0	..	SW 3
		14.15	728.6	76.3	65.2	..	..	SW 1
		18.45	729.0	71.2	64.0	..	..	SW 0
28	28	6.35	730.6	59.6	57.5	56.0	..	.. 0
		18.15	730.0	68.3	61.2	..	..	.. 0
	29	6.15	730.6	54.3	50.2	48.0	..	.. 0



*Meteorological Observations during our tour—contd.*

Place of Obs.	Date.	Time of Obs.	Bar. Pressure (uncorrected.)	Temperature.			Wind.	
				Dry Bulb.	Wet Bulb.	Min.	Max.	Dir. Vel.
Phalodi	.. ..	Oct. 29	738.7	76.0	61.4	..	..	0
		30	740.0	57.3	51.7	55.2	..	0
			739.5	79.2	57.8	..	..	0
Bap Shihad	.. ..	20.15	738.6	71.3	56.4	..	79.5	0
		4.45	741.4	56.0	52.7	51.0	..	0
		20.0	739.5	64.4	56.9	..	..	0
Loharki	.. ..	4.15	739.3	54.8	52.7	..	..	0
		12.30	742.5	81.8	64.3	..	..	1
		19.50	742.7	64.4	58.6	..	85.2	1
Sodakoer	.. ..	3	742.4	58.5	54.0	52.5	..	0
			746.3	81.5	64.3	..	..	1
			745.5	71.0	60.0	..	85.5	0
Jaisalmer	.. ..	5	744.1	79.8	59.1	..	..	0
			744.2	73.0	52.8	..	..	3
			744.8	50.2	47.3	39.5	..	1
	7	6.45	744.6	80.0	54.3	..	..	0
		12.45	744.1	68.5	50.8	..	..	3
		21.0	745.3	57.5	40.3	34.3	..	1
	8	7.0	745.3	76.5	55.4	..	..	1
		14.0	745.0	68.3	52.5	..	78.0	1
		20.30	744.0	75.2	55.0	..	..	4
	9	15.15	744.4	68.3	49.6	..	..	1
		20.30	744.9	66.5	52.3	33.4	..	1
		11.0	743.7	58.4	50.4	..	..	1
Devikot	.. ..	20.30	739.0	77.7	54.8	..	..	0
		14.30	738.0	78.2	58.5	..	..	0
		14.45	738.3	68.7	54.9	..	..	0
Vinjarai	.. ..	11						0



A.—Sandy plain West of Jaisalmer town with scrub vegetation. To the right : Small pond with *Acacia arabica*. On the hill in the background : Jaisalmer Fort.



B.—Low lime-stone hills near Jaisalmer town, rising abruptly from the above plain. Predominant plant : *Crotalaria burhia*.





The direction of the wind indicates the point from which it blows. The direction within brackets after a species of cloud below indicates the point towards which the cloud moves, the accompanying number its velocity on a decimal scale. The amount of clouds is also indicated on a decimal scale, 0 meaning a nearly clear, 10 an overcast sky. The abbreviations refer to the international system for cloud names.

*Jodhpur.*

October 19. Sky Clear.

October 20. 6-30 a.m. Sky : 0 ; Ci.  
All day an increasing quantity of light Ci.

October 21. 7-0 a.m. Sky : 3 ; Ci.  
2-15 p.m. Sky : 2 ; Ci.

*Balarwa.*

October 23. 8-0 p.m. Sky : 10 ; Str.-Cu., Al.-Cu., Al.-Str.  
8-0 p.m.—9-30 p.m. Halo 23° round moon.

October 24. 6-0 a.m. Sky : 10 ; Str.-Cu., Al.-Cu., Al.-Str.

*Osian.*

October 24. 8-45 a.m. Sky : 10 ; Str.-Cu., Al.-Cu., Al.-Str.  
0-45 p.m. Sky : 10 ; Str.-Cu., Str.-Cu.-Lent., Al.-Cu., Al.-Str.  
1-45 p.m.—5-0 p.m. Sky : 10 ; Nb., Str.-Cu., Al.-Str.  
A few drops of rain.

8-15 p.m. Sky : 10 ; Al.-Str.

10-0 p.m. Fine rain.

October 25. 6-30 a.m. Amount of rain fallen : 0·03 inch.  
Sky : 10 ; Str. [W 7], Al.-Str. [E 0].  
Fine rain.

*Bhikamkor.*

October 25. 10-15 a.m. Sky : 10 ; Nb. [W 7].  
1-0 p.m. Sky : 10 ; Nb.

Upto 5-30 p.m. Fairly strong rain, afterwards  
finer. 5-45 p.m. Amount of rain fallen ; 1·11  
inch. Sky : 10 ; Nb. [SW 7].

About midnight : Thunder-storm.

October 26. 7-15 a.m. Amount of rain fallen : 3·62 inch.  
(rain gauge full).

Sky ; 10 ; Nb. [SSW 6].

9-0 a.m. Amount of rain fallen ; 0·07 inch.

2-15 p.m. Sky : 10 ; Nb. [S 5], Al.-Cu.

5-35 p.m. Sky : 10 ; Nb. [S 4], Al.-Cu. [NNE 2]. Al.-Str.  
The rain has stopped. About 0·5 inch. may be  
assumed to be lost.

5-50 p.m. Fragments of double rainbow in the clouds in SE.  
Fine rain. Nb. dispersing. Mamm.-Nb. vi-  
sible at sunset.

October 27. 7-0 a.m. Sky : 10 ; Str. [SW 8].  
Fog and heavy dew.

2-15 p.m. Sky : 0.

6-45 p.m. Sky clear.

October 28. All day : Sky clear.

*Phalodi.*

October 29. 6-30 p.m. Sky : 0 ; Ci.-Str. (in S).

October 30. All day : Sky clear.

*Bap.*

November 1. Early morning : Sky : 1 ; Ci.

*Shihad to Vinjorai.*

November 1 to Nov. 11. Sky clear.

## 2. CLIMATE AND VEGETATION.

From what has been said above, it is clear that the climate is hostile to all vegetation, only plants possessing special adaptations being able to establish themselves. These adaptations are in general of two types, having two distinct objects in view : to enable the plant to obtain water, and to retain it when obtained. Those interested in the anatomical peculiarities of the plants of the region are referred to the paper by T. S. Sabnis : "The Physiological Anatomy of the Plants of the Indian Desert," at present appearing in the *Journal of Indian Botany*.

The struggle for existence between the plants, of the same or of different species, is practically non-existent, there being plenty of vacant spaces, and the formations being generally of the open type. The chief exceptions to this rule are the following parasites :—*Cuscuta hyalina* (growing on many host-plants, see Vol. XXVI, p. 543), *Striga ocobancheoides* (on *Lepidagathis trinervis*), *Striga euphrasioides* (on grasses, etc.), *Cistanche tubulosa* (on *Capparis decidua*, see plate XXII-B.)—The case of *Crotalaria burhia* is discussed under the sand formation. Possibly the abundance of this plant may have something to do with nitro-bacteria, living in symbiosis with the plant in its root nodules.

Many seeds fail to germinate, and numbers of seedlings are destroyed, thus never reaching maturity.

The bulk of the vegetation consists of a kind of scrub made up of shrubs and perennial herbs, capable of great drought resistance and of a period of comparative rest, extending throughout the greater part of the year. There are few trees to be seen, and these are stunted and generally thorny or prickly, thus protecting themselves against plant-feeding animals. Of the latter, there are vast herds of camels, cattle, sheep and goats, forming the chief wealth of the rural population, and appearing to thrive in spite of the arid nature of the country (Plate XXXII-B.). The presence of these herds is a factor of some importance in the economy of the region, certain plants being kept down, while others remain untouched. Thus it is sometimes impossible to find a fairly complete specimen of many plants over large areas, the branches being eaten, and only the woody base left. Plate XXXIV-A. shows a case, where a specimen of *Heliotropium undulatum* (the plant to the left) has escaped total destruction owing to its being accidentally protected by an ant-hill. On the other hand, the specimen of *Sericostoma pauciflora* to the right is not touched although unprotected, in spite of its being a close relative of the former plant. Sometimes a spiny shrub protects a plant, otherwise greedily eaten by animals. A case of this is shown in Plate XXXIV-B., where a fine specimen of the grass *Andropogon annulatus*, reaching the unusual height of eight feet, has taken refuge among the branches of the very prickly *Zizyphus rotundifolia*. The luxurious growth of the grass is due to the local presence of moisture in the gravelly soil. Of unprotected specimens in the same habitat, practically only the roots were left. Below we give a list of the plants especially liked by camels : *Capparis decidua*, *Salvadora oleoides*, *Haloxylon salicornicum*, *Fagonia cretica*, *Crotalaria burhia*, *Clerodendron phlomidis*, *Calligonum polygonoides*, *Indigofera ovalifolia*.

The proper desert plants may be divided into two main groups : those depending directly upon rain, and those depending on the presence of subterranean water.

The first group consists again of two types : the "ephemerals" and the "rain perennials."—The ephemerals are delicate annuals, apparently free from any xerophilous adaptations, having slender stems and root-systems and often large flowers. They appear almost immediately after rain, develop flowers and fruits in an incredibly short time, and die as soon as the surface layer of the soil dries up. We did not come across any plants of this type, which may however have been due to the fact that our visit took place towards the end of the rainy season.





A.—*Heliotropium undulatum*, partly eaten by animals, and surrounded by an ant hill. To the right: *Sericostoma pauciflora*. (Gravel plain near Devikot, in Jaisalmer State).



B.—On moist ground near Devikot village. *Andropogon annulatus* protected by *Zizyphus rotundifolia*.





The few annuals observed have generally a comparatively long taproot, the exceptions from this rule being best regarded as accidental visitors to the region (such as *Spermacoce stricta*, *Asphodelus tenuifolius*).—The rain perennials are also visible above ground only during the rainy season, but have a perennial underground stem. Here belong the bulbous Monocotyledons, of which *Dipcadi erythraeum* is a representative from our region, also various *Cyperaceæ*.

By far the largest number of the indigenous plants are capable of absorbing water from deep below the surface of the ground by means of a well developed root system, the main part of which generally consists of a slender, woody tap-root of extraordinary length. This adaptation in some cases enables a plant to dispense with all xerophilous characteristics. A noteworthy example is *Citrullus colocynthis*, one of the *Cucurbitaceæ*, which remains green throughout the year, in spite of its long, trailing branches, which often reach 50 ft. in length, and bear a fair number of large leaves. A fruiting specimen of the plant is shown on Plate VII-A.

Generally, however, various other xerophilous adaptations are resorted to such as reduced leaves, thick tomentum, succulence, coatings of wax, thick cuticle, protected stomata, etc., all having for their object a reduction of transpiration. The plants belonging here are chiefly more or less woody perennials. A few annuals occur, however, such as the rare *Monsonia heliotropioides*.

### 3. FORMATIONS.

It was originally our intention to adopt the nomenclature used by F. E. Clements in his work "Plant Succession" (Washington 1916) for our description of the vegetation of the Indian Desert. For many reasons, into the details of which we cannot enter here, this plan has been abandoned. Accordingly the term "consocieties" used on some of the earlier plates (Pl. VII-B., X-A.) should be replaced by the term "family." Similarly the words "in the consocieties" under Pl. X-B. should go out.

The uniformity of the climate of our region causes a corresponding uniformity of the vegetation. The formations may therefore be taken as exclusively edaphic, and it is convenient to adopt Schimper's definition: "The communities of plants as determined by the qualities of the soil are termed formations."

Accordingly, we distinguish the following five formations: Aquatic, Sand, Gravel, Rock, Ruderal.

For the sub-divisions of the above formations we use the term association, following Warming's definition: "An association is a community of definite floristic composition within a formation."

We shall further use the term family, introduced by Clements, but in the following generalized sense: A family is a community of individuals belonging to a single species, and occupying a definite area of whatever shape or size, the boundaries of which are determined by the numerical distribution of the individuals, no account being taken of the eventual occurrence of other species within the area.

Thus Pl. X.-A. shows a single family of *Eclipta erecta* with abrupt boundaries, the change in numerical distribution within the occupied area being continuous. In Pl. X.-B. we have several isolated families of the same plant. In the case discussed no other plant occupies the same locality, and we may therefore describe the local vegetation as a pure association of *Eclipta erecta* consisting of several families. A pure association may coincide with a family, as in Pl. XXIV.-A., XXV.-B. (*Cyperus arenarius*), or form part of a family, as in Pl. XXV.-A. (*Calotropis procera*) or VII.-B. (*Indigofera argentea*). The area occupied by a family of *Aristida hirtigluma* shown in Pl. XIX.-B. contains also other species and hence the plant does not form a pure association; this is of course the rule.

## Aquatic Formation.

Water is naturally scarce within our region and has to be collected during the monsoon for irrigation purposes. Wherever possible artificial basins are constructed, preferably with a rocky bottom, since a sandy or gravelly bottom retains the water only with difficulty. At the time of our visit the amount of water in these tanks was unusually great owing to the exceptionally heavy rains. Just before the rainy season, the smaller ones are generally empty and during ordinary years, the maximum water level must be far lower than that observed by us.

The chief tanks visited by us are :

- (1) Kailana Lake near Jodhpur (Pl. V-A.) occupies a comparatively large rocky valley and supplies Jodhpur city with water. The dam is shown in Pl. I B., and the luxurious vegetation on the outside forms a striking contrast to that of the surrounding arid hills. The lake itself contains masses of *Algæ*, among which various species of *Chara* were noted. The *Naiedacæ* were represented by *Potamogeton crispus* and *Naias australis*.

There were hardly any semi-aquatic associations along the shores of the lake at the time of our visit, although they probably would be well developed after the partial drying up of the water. Below the dam, however, we found *Bergia ammannioides* and *B. odorata* associated with *Ammannia baccifera* and *A. multiflora*.

- (2) The tank above the Balsamand Garden near Jodhpur is a small rock basin in which *Trapa bispinosa* was collected. We have not observed this plant in any other locality and conclude that it must have been cultivated here.
- (3) The lake near Mandor (Pl. VI-A.) is a large shallow expanse of water in the plain, and is rather difficult of approach on account of its marshy shores. Mandor was our best locality for *Cyperaceæ* and many of these plants occurred in the neighbourhood of the lake. The vegetation on the banks along the muddy irrigation canals leading from the lake is best described as ruderal. The lake as shown on the photograph is probably much larger than in ordinary years.
- (4) A small pond surrounded by marshy ground about 8m. north of Phalodi (Pl. XXIV-B.) was filled with muddy water devoid of vegetation, except for a number of immature specimens of *Vallisneria spiralis*, a plant not observed in any other locality. The shores were covered by high *Cyperaceæ* partly associating with *Andropogon annulatus*. The surrounding damp gravel was a favourite habitat of *Bergia odorata*.
- (5) The small village tank at Bap has a gravel bottom and partly marshy shores. The submerged association observed by us consisted of *Potamogeton pectinatus*, *Naias graminea*, *Naias Welwitschii*, and *Chara sp.*
- (6) Gharsisar Lake outside Jaisalmer town (Pl. XII-A.) is not of much interest botanically.
- (7) The same may be said of Amarsagar and Bada Bag tanks, both artificially dammed rock basins (Pl. XII-B., XI-B.), although the shores may have a rich vegetation in the middle of the dry season. Both irrigate extensive gardens. In the Bada Bag (Pl. XI-A.), a large muddy field of almost pure *Ammannia baccifera* association was observed.
- (8) A small artificial pond with gravel bottom between Seu and Badka had a flora different from the ordinary type. There was found an association of *Nymphaea lotus* and *Limnanthemum parvifolium*, neither of which was observed elsewhere. We noted also a zone of *Chara sp.*
- (9) A few drying-up pools near Barmer railway station were bordered by pure families of *Eclipta erecta* (Pl. X-A. & B.). Although this plant is ruderal rather than aquatic, it is mentioned here owing to the fact, that



a habitat of this type seems necessary for it to thrive in this region. It attains its maximum development about 2-3 feet above the surface of the water nearer which young plants and seedlings only are found, so that zones and islands result.

- (10) Many smaller pools or tanks were met with, but proved very uninteresting. There is generally one or two near every village. Rivers containing water there were none. We crossed a river-bed 2 miles East of Sodakoer (Pl. XXX), the vegetation of which hardly differed from the surrounding gravel area. A sandy river-bed at Barmer was totally devoid of vegetation.

From the above may be seen that the submerged flora is, as might have been expected, rather poor, and very local. The semi-aquatic flora consists mainly of certain *Cyperaceæ*, *Lythraceæ* and *Elatinaceæ*, and is often well developed as regards number of individuals. The almost complete absence of *Hydrocharitaceæ* is noteworthy. The genus *Rotala*, too, is absent. There are hardly any aquatic grasses. *Desmostachya bipinnata* may perhaps be referred here. It frequents irrigated gardens and margins of tanks.

The occurrence of *Naias australis* and *Naias Welwitschii* within our region is very interesting, both plants being new to India.

(To be continued.)

## THE BIRDS OF PREY OF THE PUNJAB.

BY

C. H. DONALD, F.Z.S., M.B.O.U.

## PART VI.

*(Continued from page 140 of this volume.)*

## Type H.

This chapter of the "Birds of Prey of the Punjab" deals with 3 genera, comprising 11 species, of what must be far and away the best known of Raptores by name at least.

All the species in this Type (H) have three characteristics in common which separate them from the members of all other Types, at a glance. The first mentioned of these characteristics is by far the most important, and in itself sufficient to differentiate them and to place them in this Type. These characteristics are:—

- (a) Upper mandible *toothed* and sometimes a festoon is also present behind the tooth; nostril circular with a central tubercle.
- (b) Irides some shade of brown, usually very deep and almost black in some lights.
- (c) Wings long and pointed but not always reaching to tip of tail.

The three genera are:—*FALCO*, *ÆSALON* and *TINNUNCULUS*, i.e., the Falcons, Merlins and Kestrels.

Besides the above, there are in India, four other genera comprising in all 8 species which all have toothed mandibles, viz:—*Baza* (3 species) which are distinguished by having a sort of double tooth; *Erythropus* (1 species); *Microhierax* (3 species) and *Poliohierax* (1 species) but none of these are found in the Punjab so far as I am aware.

Now, though all the true Falcons, the Merlins, and the Kestrels can be placed in their proper Type by a single glance at the beak and nostril, the separation of the different species from each other, in *Falco*, is by no means so simple. Variations in plumage from the young to the adult stage are considerable, and differences in size of specimens, of the same species, are by no means negligible.

Like most of the Raptores previously dealt with, the Falcons, Merlins and Kestrels are easily distinguished by their flight, not only as such, but can usually be correctly placed in their proper species, by anyone who has studied their flight, but it will not be an easy matter to put the subtle differences in black and white and still make them intelligible to my readers.

The 3 genera and 11 species of this Type are as under:—

Genus.	SPECIES.	
<i>Falco</i>	<i>F. peregrinus</i>	The Peregrine Falcon
"	<i>F. peregrinator</i>	The Shahn "
"	<i>F. barbarus</i>	The Barbary "
"	<i>F. jugger</i>	The Laggar "
"	<i>F. cherrug</i>	The Saker or Cherrug Falcon
"	<i>F. milvipes</i>	The Shanghar Falcon
"	<i>F. subbuteo</i>	The Hobby
"	<i>F. severus</i>	The Indian Hobby
<i>Æsalon</i>	<i>Æ. regulus</i>	The Merlin
"	<i>Æ. chiquera</i>	The Turumti or Red-headed Mer- lin.
<i>Tinnunculus</i>	<i>T. alaudarius</i>	The Kestrel

## KEY TO THE GENERA.

- Falco*. Size medium to small; toes long, middle toe without claw as long, if not longer than, the tarsus; tail rounded, *not* graduated; 2nd quill longest, 1st much longer than fourth.
- Æsalon*. Size small; 2nd and 3rd primaries longest and subequal, first primary much shorter and approximately equal to the fourth; first two quills always notched on the inner web. Other characteristics as in *Falco*.
- Tinnunculus*. Size small; foot much smaller and weaker than in the Falcons, mid-toe without claw being from two thirds to three fourths the length of the tarsus; Tail graduated, outer rectrices being 1 to 1½ inches shorter than the middle pair. Upper parts tinged with rufous throughout, with black bands in the females and young.

## KEY TO THE SPECIES.

- F. peregrinus*. Size medium, wing in male about 12·5 and in female about 14·5; 1st primary *longer* than the third; cheek-stripe broader than the eye; no nuchal collar; crown dark grey (sometimes, though rarely, black); breast very slightly rufous.
- F. peregrinator*. Size medium, wing in male about 11·5 and in female about 13"; 1st primary *longer* than the third; cheek stripe broader than the eye; crown black or blackish; under parts rufous.
- F. barbarus*. Size, a little smaller than the above, wing 11 in males to 12·5 in females; 1st primary *longer* than the third; cheek-stripe narrow, a buff nuchal collar; *head ashy grey or rufous*.
- F. jugger*. Wing in male about 12·5 and in female about 11"; 1st primary *subequal to 3rd or shorter*; a distinct narrow cheek-stripe; middle tail feathers entirely brown in adults.
- F. cherrug*. Wing in male about 14·5 and in female about 15·5"; 1st primary *subequal to 3rd or shorter*; no cheek-stripe; middle tail feathers, usually brown with white spots on each web, adults not banded above.
- F. milvipes*. Wing in male 14 and in the female about 16"; adults banded with rufous on back, wings, and tail.
- F. subbuteo*. Size small, wing of male 10½ and of female about 11"; Breast white or buff with brown streaks.
- F. severus*. Very similar to *F. buteo* except that this species has a deep rufous breast, unspotted in adults.

*N.B.*—Both the Hobbies (*F. subbuteo* and *severus*) resemble the Peregrine group in having the first primary longer than the third.

The size, as indicated by the length of wing, is somewhat misleading when the Shaheen or Barbary Falcons are compared with the Hobbies. Half an inch or an inch would appear to make very little difference, but the former are *altogether heavier and robuster* birds with *much* longer toes and *more* powerful claws generally. Whereas the mid-toe without claw in the Hobbies would not exceed 1½" in length, in the remaining six species it will be found to be 1¾" or over.



*Æ. regulus.*

Size small, wing about 8 to 9"; 2nd and 3rd primaries longest and subequal, first much shorter and approximately equal to the 4th; crown grey or brown, dark-shafted.

*Æ. chiquera.*

Size small, wing in females about 9"; 2nd and 3rd primaries longest and subequal first much shorter and approximately equal to the fourth; crown chestnut.

*T. alaudarius.*

As for genus.

## TYPE H.

## FAMILY FALCONIDÆ.

## SUBFAMILY FALCONINÆ.

## Genus FALCO.

No. 1254. *Falco peregrinus.* The Peregrine Falcon.

*Characteristics.*

Size medium, length of male about 15" and of a female about 18"; 1st primary longer than the 3rd; cheek-stripe broader than the eye; no nuchal collar, crown dark grey, sometimes almost black; breast very slightly tinged with rufous.

*Colouration.*

In adults. Slate-grey above, darker on the head and neck and gradually shading down to a pale grey on the rump, most of the feathers dark-shafted and except on the head and nape with dark cross-bands. Cheek-stripe black; Primaries blackish, with white bars on the inner webs, except near the end; Secondaries ashy grey with darker cross-bands; tail dark grey or blackish with numerous ashy-grey cross bars, closer together and paler towards the base, extreme tip and borders near tip, whitish; lower parts white with a rufous tinge, a few brown or black spots on the lower breast and middle of the abdomen, and narrow dark bars on the flanks, lower wing-coverts, thigh coverts, and under tail-coverts.

Young birds are very dark brown above, the feathers edged with rufous, the buff bases of the feathers showing about the nape; the tail feathers with about six transversely oval rufous spots on each web, forming imperfect cross-bars; primaries as in adults; cheek-stripe narrower; lower parts white, buff, or rufescent, spotted, except on the throat, with broad brown elongate median stripes, becoming broad spots on the flanks (Blanford).

The transition from the young to the old plumage is gradual but considerable and, I do not think there can be much doubt, that variations of a marked degree exist in individuals of the same age.

The bird with an almost jet black head and dark-brown back and under parts of a rich cream colour with deep brown markings, is an entirely different looking bird to the one with the slaty grey back and pure white under parts, sparsely speckled with black, and transverse bars on the flanks.

A few years ago I caught a tiercel with a head and nape almost jet black and resembling that of the next species, much more than that of the Peregrine.

"Bill bluish, dark at tip; cere yellow; irides brown; legs and feet yellow." (Blanford).

*Measurements.*

"Length of a female about 19; tail 7.5; wing 14.5; tarsus 2.1; mid-toe without claw 2.25; bill from gape 1.3; Males are considerably smaller: length about 16; wing 12.5." (Blanford).

Mr. Hume records an Indian female measuring, 20.25 in length; expanse 39; wing 13.25; tail 6.75; tarsus 2.25; mid-toe 2.06.

*Habits, etc.*

The Peregrine Falcon is a winter visitor to the Punjab, though it is possible that some few stragglers may even breed in the Himalayas, and Hume records having seen a trained Peregrine which the owner informed him had been taken from a nest on the Indus River. Personally I have never, to my certain knowledge, seen this bird in the Himalayas during the summer.

The *Bhyri*, by which name this species is known to the Indian falconer, is essentially a bird of the river and jheel. It arrives in Northern India just after the ducks make their appearance and disappears when they go. It is an early hunter and may be seen on the wing just after dawn, flying low over the extensive plains bordering any of our Punjab rivers. When hunting, the Peregrine flies low and fast, the wings usually slightly bent back from the first joint, and with fast powerful beats.

On viewing ducks on a pool or a flock of doves in the fields, the falcon drops to within a few feet of the ground, the beat of the wings become even faster than before and the wings bend closer into the body and it fairly hurls itself through the air and into the middle of the flock, which will probably rise "en masse" when the falcon is still a few yards distant. Having selected one particular bird, the chase begins, unless by good fortune for the falcon, it ends before it really begins in an easy capture. Usually the dove succeeds in evading those dread talons in the first instance and neatly doubles back. Up rises the falcon almost vertically to her "pitch", turns, and shoots down like an arrow in the wake of its quarry following every turn and twist of the latter.

Another miss and up she goes again to repeat the performance, determined to secure its breakfast before the dove can reach the shelter of the trees surrounding a village, not far distant. The dove reaches the fringe of trees closely followed by the falcon and dashes right into the branches of the nearest tree. The falcon once more rises high into the air, circles round once or twice in the hope of its quarry, or another bird leaving the security of the trees for the open ground beyond, gives up the chase and flies straight away, rising steadily as it goes, to make an attack elsewhere.

During the day the Peregrine betakes itself to some big tree overlooking a river or a jheel, and shelters from the heat of the sun. It usually perches on one of the thicker branches about half way up and seldom on the topmost branches, like so many of the other falcons do.

Another favourite haunt of the Peregrine is the sandy bed of the river itself. A mound of sand, a half buried log, or a stump or stake in the ground, from which it can view the country for miles round, have attractions for a hungry falcon.

Whereas duck probably form its staple diet, a crow colony is almost a certain find for a hungry Peregrine late in the evening. One that has failed to secure a tit-bit in the shape of a duck or a dove, earlier in the afternoon, will wend its way to a crow colony sooner or later, whence it need never go hungry, even though the quality of the meal is not all that can be desired.

I have already stated that the flight of the birds in this type (H) is by no means easy to describe. The flight of the falcons generally is not only distinctive but is capable of a more or less intelligent description but to give such a description as will enable a novice to differentiate between the different members of this type, is quite another matter.

Indeed the trained eye has to depend on factors other than shape of wings, the way they are held, length of tail, etc., to separate one falcon from another on the wing, and even where the flight itself is distinctive the difference is subtle enough to defy description though noticeable to the trained eye. Size and colour of certain portions of the body or wings must be taken into account and even then it is not always possible to make absolutely certain of your bird.

The sharp pointed (swallow like) wings, the shorter tail, proclaim the falcons at a glance.

The wings are held level, *i.e.*, on the same plane as the body and even when soaring will frequently be found to be slightly bent, though this is by no means always the case.

If seen at close quarters, the white or light coloured breast (in the adult plumage) will help to differentiate the Peregrine from the Shaheen, which has a rufous breast and under parts. The latter's black head and very dark upper parts are also a guide to its species.

The Barbary resembles the Shaheen except for its light coloured head.

The Laggar, in adult plumage, has a very white breast, often shows a slight white patch on the under-part of the wing, and the marking of the wing is also "patchy". Moreover they usually hunt in couples.

The Cherrug or Saker Falcon is very much bigger and is seldom to be found in the haunts of the Peregrine or the Shaheen. It affects dry sandy tracts.

The Merlins and Hobbies are all very much smaller.



## Genus FALCO.

No. 1255. *Falco peregrinator*. The Shaheen Falcon.*Characteristics.*

Length of male about 15", of a female about 18"; 1st primary longer than the 3rd; cheek-stripe broader than the eye (sometimes, in very old birds, the cheek-stripe is fused into the back of the head and nape and indistinguishable in itself), no nuchal collar, crown blackish; lower parts deep rufous. Wing 11.5 to 13".

*Colouration.*

"This falcon is distinguished from the Peregrine at all ages by its darker and almost black head and nape, and by the deeper rufous of the lower surface, especially on the breast, abdomen and lower wing-coverts. The colour of the lower parts varies, however, greatly; in some birds, especially those from Southern India, it is deep ferruginous or chestnut, whilst in many Himalayan birds it is scarcely darker than in some (exceptional) Peregrines. Except in very old birds there is almost always in the present species some rufous sprinkled over the nape, owing to there being a rufous band on the feathers between the black ends and the white bases. In old birds of *F. peregrinator* all markings disappear on the breast and abdomen very narrow bars remaining on the flanks alone, and bars almost disappear on the pale ashy feathers of the back, rump, and scapulars.

In young birds of the year the whole upper surface is almost black, the feathers at first having rufous edges which soon disappear by wear; there is some rufous on the nape; and the tail is marked with transverse, oval, rufous spots as in the Peregrine but they are more numerous; the chin and throat are pale rufous and unspotted, the breast and abdomen marked with longitudinal drops, but the lower abdomen is sometimes unspotted." (Blanford).

"Bill slaty blue, dark at the tip; cere, orbits and legs yellow; irides intense brown."

*Measurements.*

"Length of a female about 18"; tail 6.5; wing 13"; tarsus 2; mid-toe without claw 2.1; bill from gape 1.25; of a male, length 15; wing 11.5. (Blanford).

*Habits, etc.*

This beautiful falcon is a dweller of the hills and breeds freely all over the lower hills in the Punjab, up to an elevation of about 7,000 ft.

Pigeons, doves, parrots, mynahs and thrushes come in for the attentions of this falcon and to watch one hunting, particularly in the hills, is an education. Like the Peregrine it is a very early hunter and begins its day if anything earlier than does the latter, and certainly continues to a later hour in the evening.

I have had the good luck on several occasions to have my camp near a Shaheen's pet hunting grounds, and it is extraordinary how faithful they are to certain localities, even to the extent of the same branch of a particular tree in that locality.

In Dharmsala there are cliffs just above my house. Above and all down one side, these cliffs are surrounded by a heavy oak forest. Immediately below is fairly

open ground, below which is a small lake and below that again the Cantonments. Further away to the left is a village with a wide extent of cultivation, and down below there is an unrestricted view of the low-lying hills of Kangra and the plains.

On a much lopped oak tree, at one corner of the cliffs, the Shaheen is to be found any afternoon, between the months of March and the middle of May.

Thereafter she vanishes to re-appear again in September. Her pet tree commands a magnificent view and no pigeon can fly anywhere in the Cantonments, nor dove alight in the village fields, which escapes her all seeing eyes.

Periodically she leaves her perch and makes a circuit of the hill, as if bored with nothing to do, returning within ten minutes or quarter of an hour, to her own perch.

From this coign of vantage it is a treat to see her give chase. If you watch her on her perch for a few minutes you will see her head bob up and down as though focussing the eyes on some distant object.

Suddenly, with a spasmodic movement her wings half open and she gets lower on her perch, as though preparing for a spring. Thus she sits for a few seconds with her wings still half open, being blown about in the breeze, her eyes fixed straight ahead of her and downwards and the head shoots up and down as though on springs. As suddenly she changes her mind, draws up her wings and sits bolt upright, but only for an instant. Again her wings half open and her mind is made up and off she goes. With fast beating wings she rises steadily, but in a different direction to that in which she had previously been looking. Up and up she goes then suddenly turns and shoots down like an arrow at incredible speed. The stoop is, however, not that of the trained falcon, with wings tightly glued to the body, but a succession of such stoops intercepted by moments of wildly vibrating wings hurling and pushing her through the air at ever increasing speed. Down, down she comes missing the top of a rhododendron bush by inches and with a great swish, a streak passes within a few feet and rises straight up into the blue sky, for two or three hundred feet without a check, then the wings open wide and the falcon circles two or three times and then flies off to her old perch.

The Merlin is the only other falcon that follows its quarry in this way, and somewhat resembles the ordinary flight of a wagtail or sparrow, except that it is not so undulating but much more direct.

The Shaheen arrives at her hunting grounds at about four o'clock and if not successful in procuring her dinner earlier, will be seen hunting bats, as a last resort, well after sunset.

It is by no means uncommon even on the plains and I have seen it as high up as 9,000 ft. in the Himalayas.

They build in cliffs, a nest composed of sticks and lay brownish yellow eggs, speckled and blotched with reddish brown measuring 2 by 1.63. Mr. Dods-worth records a nest he found in the vicinity of Simla on the 30th March 1913 containing two eggs. He says :—"In the present case there was no nest of any kind, and the eggs were reposing on the bare ground. The colouration of the two eggs is entirely different. One—a magnificent specimen is a rich uniform deep brick-red, the other has a ground colour of brownish yellow, and is heavily blotched with reddish brown. In shape they are broad ovals, a good deal pointed towards the small end. They measure (1) 1.92"  $\times$  1.53", (2) 1.88"  $\times$  1.52".

TYPE H.

Genus FALCO.

No. 1256. *Falco barbarus*. The Barbary Falcon.

*Characteristics.*

Length of male about 15 and of a female about 17; first primary longer than the 3rd; cheek-stripe narrow; a buff nuchal collar; head ashy grey or rufous.

*Colouration.*

"Head more or less ashy grey or brown, with a white or buff frontal band, and varying to rufous or a chestnut brown towards the nape, the feathers being dark shafted." Sides of neck buff; broad nuchal collar rufous, often mixed with brown (occasionally nearly the whole crown and nape are light chestnut); upper parts ashy grey with dark or blackish cross-bars, the bars broad and predominating on the upper back and wing-coverts, less broad on the scapulars, narrow, and in old birds faint, on the rump and upper tail-coverts; primaries dark brown, closely banded with pale rufous on the inner webs except near the tips; secondaries ashy grey with dark cross-bands; tail with alternating bars of ashy grey and blackish grey, the former broader near the root, the latter near the end, tip whitish; chin and throat white, or rufescent, rest of lower parts pale rufous, depth of tint varying; the breast in some with a few narrow dark shaft lines and the abdomen with small spots; the flanks and under-wing coverts with dark bars, but in old birds all markings on the breast and abdomen disappear, and only arrow-head shaped marks remain on the flanks.

Young birds are dark brown above the feathers with broad rufous edges, which wear off after a time, scapulars with rufous spots; upper tail-coverts barred with rufous; forehead, middle of crown and sometimes superciliary streaks, with the nuchal collar, buff or rufous, the collar mixed with brown; quills brown, barred as in adult; tail brown with equal rufous bars at regular intervals; lower parts more or less rufous



pale and whitish on the throat, marked with elongate spots on the breast and abdomen, and broader spots on the flanks." (Blanford).

"Bill bluish, black at the tip; cere legs and feet yellow; irides dark brown."

*Measurements.*

"Length of a female about 17"; tail 6.5; wing 12.5; tarsus 1.9; midtoe without claw 2; bill from gape 1.1; length of males 15; tail 5.75; wing 11" (Blanford), expanse about  $3\frac{1}{2}$  feet.

*Habits, etc.*

Mr. Hume records a nest of this species having been taken at Murree by Major Delme Radcliffe and the Gumal Pass, near Dera Ismail Khan, is another locality where the nest has been taken. I believe the young of this species are frequently brought in by Pathans from the Samana Range near Kohat and I do not think that there is much doubt that the Barbary Falcon breeds in the hills bordering the North West Frontier Province, but I know of no instance of the nest having been found in the Punjab, apart from the one above mentioned.

I have seen and caught the bird in Bhadarwa, in the Kashmir State, in the autumn and have seen it in various parts of the Punjab Plains, but the only one I ever tamed and trained, was not nearly so good as the Shaheen.

Hume says:—"I believe, we may say that the Red-cap Falcon occurs throughout Northern India, during the cold weather, as far south as Gwalior, being rare east of the Jumna, less rare between the Sutledge and Jumna, and decidedly common west of the Sutledge specially in the Peshawar valley, and the tract west of the Indus, and that it breeds in Cabool and Cashmere and throughout the southern ranges in the Himalayas, west at any rate of Dalhousie, at heights of from four to seven thousand feet; but further information with regard to this species is much required."

The Barbary Falcon is said to breed in cliffs, and the eggs, three to four in number, resemble those of a Peregrine but are somewhat smaller.

TYPE H.

Genus FALCO.

No. 1257. *Falco jugger*. The Laggar Falcon.

*Characteristics.*

Length of male about 16; and of a female about 18; First primary sub-equal to 3rd or shorter; wing in male 12.5, in female 14; a distinct narrow cheek stripe; middle tail feathers entirely brown in adults.

*Colouration.*

"*Adult.* Forehead, lores, and supercilia white, with dark streaks; crown and nape brown, with broad rufous edges to the feathers; a streak running back above the ear-coverts, and a moustachial band from the gape sometimes continued to the eye, with some feathers round the orbit dark brown; rest of sides

of head white, with a few dark shafts beneath the eye; upper plumage from the nape brown with an ashy tinge; quills the same; inner webs of primaries, except near the end, with broad white bars, tail brown, middle feathers unbarred and pale tipped, outer feathers with whitish bars on the inner webs and white tips; lower parts white, a few dark streaks, wanting in very old birds, on the breast, and spots on the abdomen; flanks and outer thigh-coverts chiefly brown. (Blanford).

"Young birds are almost brown throughout, the chin and throat white, and some white on the forehead, sides of head, breast and lower tail-coverts, buff instead of white on quills and inner webs of tail feathers. There is a gradual disappearance of the brown on the lower parts with successive moults." (Blanford).

"Bill greyish blue, the tip blackish; cere yellow in adults, greenish grey in young birds; irides dark brown; legs and feet yellow, pale plumbeous to dull greenish grey in the young (Hume)" (Blanford).

#### *Measurements.*

Length of female about 18 inches; tail 8; wing 14; tarsus 2; mid-toe without claw 1·8; bill from gape 1·25: of a male, length 16; tail 7·5; wing 12·5. (Blanford).

#### *Habits, etc.*

The Laggar Falcon is widely distributed throughout India and is generally to be found in open plains, over scrub and thin jungle and the vicinity of cultivation and villages. It ascends the lower hills to an altitude of about 3,000 ft. but is seldom seen near heavy forests. It preys on a variety of small birds, from partridges downwards and may often be seen hunting bats in the evening. Laggars usually hunt in pairs and are past masters in following sportsmen near a snipe jheel, or when after quail. I witnessed a beautiful chase one day after a snipe, in the Kangra valley, but the snipe got away in the end.

Mr. Hume describes how a pair of these birds followed him every time he went out quail shooting near their haunts and used to stoop at the quails his party put up. "This did not happen once or twice" says Mr. Hume, "or even during one or two seasons, it was *regularly* the case for the four or five successive years, that I remember the birds returning to their favourite tree."

I have noticed this *trait* more than once, in places which are often shot over.

In the air the Laggar can usually be recognised by his very white breast and dark and white pattern on the under surface of the wing, and of course by the fact that two are generally seen together. The Turumti or Red-headed Merlin is the only other of the pointed long-winged birds which hunt in couples, and this species also has a white breast, but there is a vast difference in the size and the Laggar looks  $1\frac{1}{2}$  times bigger.

The Laggar builds, on trees, in cliffs or on ruined buildings, from January to March and lays usually four eggs, reddish or brownish, speckled or spotted all over with a darker and richer shade of the same, and measure about 2.01 by 1.57.

*N.B.*—Whatever the age or the plumage of any individual, and there is a great difference between the young and the adult, the central tail feathers in the Laggar Falcon are always plain brown, unbarred or unspotted, and this factor is worthy of careful consideration when in doubt.

#### Genus FALCO.

No. 1258. *Falco cherrug*. The Saker or Cherrug Falcon.

#### Characteristics.

Size medium, length of a female about 22" and of a male about 20. 1st primary subequal to 3rd or shorter, no cheek stripe, middle tail feathers usually brown with white spots on each web; adults *not* banded above.

#### Colouration.

*Adult.* Crown and nape white (the crown sometimes pale rufous) with black shaft-stripes, which are broader on the nape; lores and sides of head white, with scattered dark streaks; no cheek stripe from the eye, but sometimes a broken moustachial stripe from the gape; ear-coverts brown, streaked darker; upper parts brown throughout, the feathers with rufous or tawny margins, and frequently a few rufous spots forming imperfect bars on the scapulars and larger wing-coverts; quills brown, paler beneath; primaries broadly barred with white on the inner webs, the bars widening and generally coalescing towards the inner boarder; secondaries with smaller white markings or with white spots, or uniformly coloured brown; tail feathers brown, with a whitish tip, generally with round or oval white spots on both webs, but occasionally the middle feathers are unspotted (as in *F. jugger*) and sometimes the spots become on the outer rectrices imperfect bands, interrupted at the shafts; lower parts white, with large elongate brown spots on the breast and abdomen and larger spots on the flanks and thigh coverts; with age the spots grow smaller, rounder, and more scattered, especially on the breast.

"Young birds do not differ greatly from old except that the brown spots on the lower plumage are much more developed, and cover the greater part of the breast and abdomen; the head, too, is sometimes brown, and a moustachial stripe is usually well marked; the middle tail feathers are often unspotted at first.

"Bill pearly white, tipped black; cere, legs and feet dull yellow in old birds, greyish green in the young; irides dark brown, or brownish yellow or yellow." (Blanford).

*N.B.*—I have examined very many birds but cannot remember ever having seen one with eyes approaching yellow.



*Measurements.*

"Length of a female about 22"; tail 9; wing 15.5; tarsus 2.2; mid-toe without claw 2; bill from gap, 1.45; length of male 19.5; tail 8; wing 14.5" (Blandford).

*Habits, etc.*

This fine falcon is a winter visitor to the plains of India and though by no means a common bird even, in mid winter in most parts of the Punjab a good many are caught and brought into the Amritsar market for sale from the western Punjab and Bikaner. This is a desert species and seldom to be seen near jungle or cultivation, though I caught one in Wazirabad many years ago, right in the very heart of miles of cultivation.

The food of this species for the most part is said to be the Spiny-tailed lizard (*Uromastix hardwickii*) but rats and mice do not come amiss and the one above mentioned had recently caught a frog and came down to a mynah a few minutes later.

The Saker is much prized for falconry and trained to gazelle, kite, houbara, grass owl, etc., and it would be difficult to say which quarry furnishes the least sport.

More than once I have lost sight of both falcon and quarry when the latter was the grass owl, as the pair ringed and circled almost directly overhead, and on one occasion the falcon was not found till the following evening. The first Saker I ever flew at a Kite gave the most extraordinary exhibition I have ever seen and the kite, perhaps, was the most surprised object on earth or in the sky, that day. The falcon flew straight at the kite as soon as she was slipped, made a half hearted attack and then turned half right and went straight away, much to the amusement of a couple of friends who had come to see the fun. "If that is a sample of falconry I can't say much for it" and similar remarks were not lacking, as we watched the falcon getting smaller in the dim distance.

I told the falconer to call her back, but the old fellow was quite indignant at the idea, and merely remarked "You just wait and see Sahib, she is a tiger and is not going to disappoint us like that" or words to that effect.

We watched and the falcon disappeared from view altogether and even the old falconer began to have qualms that he had seen the last of the bird.

The kite, in the meantime had risen to a considerable height and had not been in the least alarmed by the falcon's half-hearted attack, and still circled round in the company of some half a dozen vultures.

The old falconer was the first to spot the falcon again and in a very ecstasy of delight shouted out, "Look Sahib, look, didn't I tell you she was a tiger, and now you will see." High up, a tiny speck against the sky, came the falcon from the direction whither she had gone and having reached well over the vultures and kite she simply shut her wings and

came down like a bullet, striking the kite fair and square, though the latter turned over to meet the blow with its upturned claws. The kite staggered as the falcon passed on her downward swoop, to rise almost vertically to her pitch, and down she came again "raking" the kite badly as the latter zigzagged downwards to avoid the falcon's talons, and this time a handful of feathers floated in the breeze behind. The kite appeared to be in a bad way and had somehow injured one wing. It did not attempt to rise but flew straight ahead and distinctly lop-sided. The falcon after her stoop, rose again only to about the level of her quarry, turned and went straight for it, the two birds flying at each other, and "bound" with out the least hesitation and the two came down in spirals with wings extended. As they came to earth we found that the falcon had got the kite with one claw by the neck and the other was firmly imbedded in the shoulder of the kite, whereas both claws of the kite were round the tarsi of the falcon.

Nothing is known of the nidification of this species in India.

#### TYPE H.

#### Genus FALCO.

No. 1259. *Falco milvipes*. The Shanghar Falcon.

#### Characteristics.

Size medium, wing in male about 14" and in female about 16"; 1st primary subequal to 3rd or shorter. Adults banded with rufous on back wings and tail.

#### Colouration.

"Crown brown, the feathers with broad rufous margins, still broader and mixed with buff on the nape; cheek-stripe black, ill defined; lores and forehead whitish. Upper plumage and tail brown, with rufous cross-bars throughout (somewhat as in a female Kestrel); inner webs of primaries mostly covered by confluent white bars, except near the tips of the feathers; lower parts buff or white with spots on the breast abdomen, and flanks, those on the breast and middle of the abdomen disappearing in old birds."

"In young birds the rufous bars are irregular and ill-marked, and those on the tail more or less imperfect. In this stage *F. milvipes* is very like *F. cherrug*, but may generally be distinguished by some of the bars going quite across the tail feathers. A nestling from Tibet in the Hume collection, attributed to this species, has, however, the tail absolutely unbarred."

"Bill bluish, black at the tip; cere, legs and feet yellow." (Blanford).

#### Measurements.

Length of female about 23"; tail 9'; wing 16"; tarsus 2.2; mid-toe without claw 2; bill from gape 1.35: length of male about 20; tail 7½; wing 14. (Blanford).

#### Habits, etc.

This is a rare winter visitor to the plains of India and little is known about it.

I cannot remember ever having seen it on the plains or in captivity, though on two occasions I have seen a bird which, I think, must have been this species high up in the Himalayas, once late in the autumn and on the other occasion early in the spring.

On both occasions the bird I saw appeared to have a very white and glistening breast and under parts. though I saw them at fairly close quarters I could not be sure of their identity.

Of its distribution Blanford says—"Tibet and Mongolia. A few birds have been obtained in the Punjab at times, and one by Sir O. St. John at Quetta."

Nothing appears to be known of its nidification."

#### Genus FALCO.

No. 1260. *Falco subbuteo*. The Hobby.

#### Characteristics.

Size small, wing about 11"; tarsus about  $1\frac{1}{2}$ " or less; mid-toe without claw about  $1\frac{1}{4}$ "; "Breast white or buff with brown streaks".

#### Colouration.

Head, cheek stripe and the side of the head, beneath and behind the eye, blackish; the supercilium and forehead whitish and a partial collar of buff on the hind-neck. Rest of upper plumage dark slaty grey, the tail feathers barred with dull rufous on the inner webs. Quills blackish with rufous bars.

Under surface white, or whitish tinged with buff and each feather with a deep brown streak; the thigh coverts, abdomen and under tail coverts rufous or deep ferruginous.

Young birds are usually blackish above with buff or fulvous edges to the feathers. Cheek and throat fulvous or pale rufous, as also the under parts generally the latter with dark brown streaks to the feathers.

"Bill bluish, with a black tip; lower base of bill, cere, and orbital skin greenish yellow; irides intense brown; legs orange (Cripps)"—(Blanford).

#### Measurements.

"Length of female about 13"; tail 6; wing 11; tarsus 1.4; mid-toe without claw 1.25; bill from gape 8: of a male wing 10.25; tail 5.5". (Blanford).

#### Habits, etc.

This beautiful little falcon is by no means rare in the Himalayas and its wonderful evolutions in the air cannot help attracting attention. Its long pointed wings make it appear bigger than it really is, and one often has to look twice to make sure that it is not a Shaheen one sees. If watched for a few seconds it will be seen to constantly change direction and turn and twist in the air in a most amazing way in pursuit of insects, on which it mostly preys. The Hobby does not usually make its appearance till late in the afternoon and may be seen circling, stooping, rising vertically, and playing extraordinary tricks in the air, sometime after all diurnal birds have gone to rest.

In spite of its extreme rapidity of flight, from a falconer's point of view the Hobbies are disappointing as they lack the dash and daring of the Merlin. They



are very easily tamed and can be taught to "wait on" at great heights and have been used in the pursuit of larks, etc., a good deal.

This species breeds in the Himalayas and the finding of the nest has been recorded (in the Journal of the B. N. H. Soc.) from various places. Lt.-Col. Rattray found a nest on Miranjani in the Murree Hills and Mr. A. E. Jones records nests from Simla (Vol. XXIV, page 359).

I have seen the bird in Kulu and in the hills behind Dharmasala in mid-summer, so presumably it breeds there though I have not, so far, found the nest.

The nest is built in trees but the Hobby does not appear to be averse to appropriating an old crow's nest as this is what Mr. Jones had to say with regard to his find—"The nest was on the outskirts of a deodar forest placed 65 feet up a deodar (*Cedrus deodarus*) at an elevation of 6,000 ft. The nest was undoubtedly built by crows (*C. macrohynchus*) but the hobbies had added a 'fence' of thorny twigs round the brim. The lining was fine rootlets, hair, grass and small pieces of twine. A few of the hobbies' feathers adhered to the nest. The eggs were slightly incubated. Two eggs are of a dull salmon-pink ground, evenly and finely speckled with liver red and some blotches of the same shade sparsely distributed over the surface. The third egg is a uniform bright brick red with a few indistinct blotches of a deeper shade collected at the larger end. The gizzard of the bird contained portions of a bird."

#### Genus FALCO.

No. 1261. *Falco severus*. The Indian Hobby.

#### Characteristics.

Size small, wing about  $11\frac{1}{4}$ ; tarsus under  $1\frac{1}{2}$ ; mid-toe without claw about 1.35; "breast deep rufous, unspotted in adults."

#### Colouration.

Very similar to the preceding species; the top and sides of head and the back of the neck black, shading to a dark slaty grey on the back. The tail dark grey with a blackish subterminal band, blackish, in the young with grey cross-bands.

"Chin, throat, and sides of neck white tinged with rufous; rest of lower parts, including the under wing-coverts, deep ferruginous red." (Blanford).

"Young birds are brownish black above, with light rufous edges, broadest on the secondaries, upper tail-coverts and tail; a few rufous feathers scattered over the nape; breast, abdomen, and under wing-coverts, deep rufous with black spots" (Blanford).

"Bill plumbeous; irides deep brown"; cere, gape and orbital skin lemon yellow; legs and feet deep yellow (Cripps). (Blanford).

*Measurements.*

"Length of a female about 11.5; tail 4.75; wing 9.8; tarsus 1.35; mid-toe without claw 1.35; bill from gape .9: length of a male 10.5; wing 9. (Blanford).

*Habits, etc.*

Very similar to the preceding species and as Hume says, *F. severus* bears the same relationship to *F. subbuteo* that *F. peregrinator* bears to *F. peregrinus*, being a more subtropical species with a comparatively limited range of distribution.

This species is common throughout the Himalayas, but I think they affect somewhat lower altitudes than does *F. subbuteo* at any rate after the young ones have left the nest. Whereas high up on the Alpine pastures *F. subbuteo* is very common in the early autumn, *F. severus* is more restricted to the glades and slopes in the vicinity of deodars and pines, at about 6 to 8,000 ft. elevation.

Anything from a single pair to almost a dozen may be seen hawking insects in the afternoons and till late in the evening.

I have tried both the Hobbies with birds for baits but never succeeded in catching one, except with a siccada. On more occasions than one, I have had one start from its perch, for a quail or a sparrow, but never has one got to within several yards of my net.

I have found the nest of this species in Tehri Gurhwal and again in Bhadarwa (Kashmir), but though this is the Indian Hobby with a much more restricted range, its nest has not been so often found as that of the preceding species, which is supposed only to be a winter visitor.

The chief point of difference between the two birds is the colouring of the under parts which, in the case of *F. subbuteo* is, at most, tinged with rusty brown while in *F. severus*, all, except the chin and upper breast is a deep ferruginous red, easily distinguished even when the bird flashes past at some distance.

In Vol. XVI, p. 518 of the Journal of the B. N. Soc. Mr. Macdonald records the finding of a nest in a cliff in Burmah.

Genus *ÆSALON*.

No. 1263. *Æsalon regulus*. The Merlin.

*Characteristics.*

Size small, wing about 8 to 9"; 2nd and 3rd primaries longest and subequal, first much shorter and approximately equal to fourth; crown grey or brown dark-shafted; First two quills notched.

*Colouration.*

In the adult male, practically the whole of the upper parts are bluish grey, varying in individuals from a pale to a dark tint, with dark brown or black shaft-stripes to each feather. The sides of the head, the forehead and the lores are whitish and the cheeks and supercilia rusty brown, as well as the nuchal collar but the crown of the head, like the back is a clear blue

grey, with dark shafts to the feathers. Primaries are blackish, the inner webs barred with whitish towards the base, and outer webs tinged with blue grey. Tail bluish grey tinged with whitish and sometimes with a faint rufescent wash, and a broad band of black immediately before the terminal white tip.

Throat white and the rest of lower plumage whitish with a rufous tinge, and dark brown shaft-stripes.

The female differs from the male in having the head brown or brownish, with dark shafts to the feathers and the upper parts generally brownish with a grey tinge and reddish margins to the feathers.

"The tail barred throughout, and the quills with rufous cross-bands; the nuchal collar and lower parts less rufous than in the male and the breast and upper abdomen with much broader brown shaft-stripes these frequently occupying more space than the white borders.

"Young birds of both sexes resemble the female, but are browner with broader rufous edges to the feathers of the upper parts, with the crown rufous (dark-shafted), and with the tail alternately banded brown and white; the quills too are barred almost across" (Blanford).

"Bill dark slaty grey, greenish at base of lower mandible; cere legs and feet yellow; irides brown" (Hume).

"Length of a female about 12"; tail 5.5; wing 8.75; tarsus 1.5; mid-toe 1.3; bill from gape .8; Length of a male 11; wing 8". (Blanford).

#### *Habits, etc.*

The Merlin is another of our winter visitants, arriving in the autumn and leaving again in the spring. It is much esteemed for falconry and for its size is second to none in point of speed and courage, and few falcons can show a more pleasing spectacle than the little Merlin in pursuit of a hoopoe or a lark. They are very easily tamed and trained but are delicate and require careful handling.

This species is much given to sitting on the ground, or on low bushes, whence it can keep a sharp look out for birds passing overhead. When in full chase the flight of this bird is not unlike that of the Shaheen but more undulating, something like that of a flock of starlings. A "bund" between two dry paddy fields or the open plains adjoining a stream or river, are favourite haunts of the Merlin and, if watched, it will be noticed that its little head is hardly still for a second. It appears to be on springs, bobbing this way and that, ever on the look out for some luckless quarry. Having sighted something worthy of its attentions, it will rise hurriedly and go off with fast vibrating wings, inclining steadily upwards. If you have the good fortune to see the object of its attentions, possibly a flock of sparrows or wagtails, you will notice that the moment they realize their danger, they will begin to mount higher and higher, but the Merlin is mounting



too and coming up with them fast. Suddenly two or three of the little birds in front leave the rest and begin to twist and swerve, as if uncertain what to do next, and suddenly decide to dive for the bushes far below. The little Merlin shows no indecision but fairly cleaves the air in a succession of regular bounds and is up to the birds it has selected for its own in a couple of seconds, and then begins as pretty a bout of aerial gyrations as one could wish to behold. Stoop after stoop, twists and turns, with a rapidity which the eye can only just follow. A drop of a hundred feet with closed wings, a sudden flick, and hawk and quarry are yards apart, and then a rise for the open sky followed by a zigzag course, as the Merlin again catches up and follows every turn and twist in the train of its quarry, only inches dividing the two. A sudden vertical rise upwards, a double back, as the Merlin shoots forward, and a headlong drop for the friendly bushes below, which the fraction of a second's start has made possible, but the little falcon turns, shuts its wings and with a couple of quick beats to give impetus, hurls herself through space and just as those friendly bushes, and safety therein, seem so very near, the little bird finds those relentless claws even nearer, and once more has to swerve, rise and twist and just as it makes one final dive for liberty it feels a sudden sharp prick, as the Merlin bears off its prize to the seclusion of a tussock of grass away from prying eyes.

The Merlin builds on the ground but the nest has never been found in India.

#### Genus *ÆSALON*.

No. 1264. *Æsalon chiquera*. The Turumti or Red-headed Merlin.

#### *Characteristics.*

Size small, wings in females about 9"; 2nd and 3rd primaries longest and subequal, first much shorter and approximately equal to the fourth; crown chestnut.

#### *Colouration.*

Very similar to the adult male in the preceding species but can always, and at any age be differentiated, by this species having a chestnut crown and nape. Generally the plumage of the upper parts is a pale bluish grey with dark shaft-stripes and a few dark bars on the scapulars and wing coverts which fade with age.

The under parts are pure, white especially the chin and breast with very faint thin black lines, which become wider and more distinct lower down. and bars on the flanks and abdomen.

The tail is grey with narrow dark bars and a broad marginal black band the extreme tip being white. The crown of the head sides and nape are bright chestnut and the forehead and lores white.

In the young bird the barring of the feathers of the upper parts is more distinct and there are more dark bars generally. There is a slight rufescent tinge on the lower parts and at the bend of the wing and the head is more rufous than chestnut with dark shaft-stripes.

"Bill bluish black greenish yellow at the base; cere orbital skin and legs yellow; irides rather light brown" (Hume).

#### Measurements.

Length of female about 14; tail 6; wing 9; tarsus 1.6; mid-toe 1.5; bill from gape .9." (Blanford). The male is smaller.

#### Habits, etc.

The Turumti is well distributed throughout this country in suitable localities. It affects groves and gardens or open plains bordered by trees and is not to be found at high altitudes.

They usually hunt in pairs and for the most part prey on small birds. The flight of this species is very different to that of the Merlin when in pursuit of game being very straight and with regular beats of the wings and not in jerks and "jumps". This is a plucky little falcon and can be trained to take the Roller and the Hoopoe and occasionally partridges. In its wild state I have seen them frequently pull down a dove and on one occasion a Blue-rock Pigeon and have caught them in a net with a mynah as a bait. I cannot remember ever having seen one soaring.

A pair I had used throughout one winter and which had afforded me much sport I kept on through the summer as pets and both became firm friends of a couple of young mynahs which I had at the same time, all four birds perching together on a towel horse in a spare bathroom.

The falcons were placed there earlier in the afternoon and the mynahs would make their way thither of their own accord and sit alongside their erstwhile enemies, in the most friendly and confiding manner.

The Turumti breeds in the early spring laying 4 eggs in a neat little nest high up in the fork of some tree. The eggs are brownish red mottled and blotched with darker red."

#### Genus TINNUNCULUS.

No. 1265. *Tinnunculus alaudarius*. The Kestrel.

#### Characteristics.

Size small length about 14"; foot much smaller and weaker than in falcons, mid-toe without claw being from two thirds to three fourths the length of the tarsus; tail comparatively long and graduated the outer rectrices being 1 to 1½ inches shorter than the middle pair; upper parts tinged with rufous throughout with black bands in the females and young.

#### Colouration.

The top of the head, the sides and the nape ashy grey with dark shaft-stripes to the feathers; ear-coverts and cheeks greyish or white and the forehead

and lores white tinged with yellow; tail, rump and upper tail coverts, like the head, ashy grey. A black subterminal band to the tail and narrow white tips. The remainder of the upper plumage is a deep brick-red with black triangular spots on back and scapulars which vary in intensity and numbers with different individuals. Quills dark brown towards the tips and nearly white at the base, with whitish bars. The under parts generally buff or pale rufous with long lines and streaks on the breast which pass into spots on the lower breast and flanks, except the lower abdomen which is unspotted; the under side of the tail is whitish, as also the wing lining, with dark spots.

Females are more dingy above, being some shade of rufous, throughout; the head feathers are streaked with dark brown shaft-stripes and the rest of the upper parts with black or blackish bars. The under parts are paler than the back and spotted with black as in the males.

The young are somewhat similar to the females, but the tail may assume its grey tinge before the head in the young male.

"Bill bluish black; gape, cere and eyelids yellow; irides brown; legs orange yellow, claws black." (Blandford).

*N.B.*—*T. cenchris* the Lesser Kestrel, has whitish or pale horny claws, but specimens of *T. alaudarius* also occasionally are met with, with light coloured claws.

#### *Measurements.*

Length about 14"; expanse  $2\frac{1}{2}'$ ; tail  $6\frac{1}{2}$  to 7"; wing  $9\frac{1}{2}$ ; tarsus  $1\frac{1}{2}$ ; mid-toe 1; bill from gape .85. Not much difference between the sexes.

#### *Habits, etc.*

The Kestrel, or Windhover, is a familiar feature of the landscape from the grassy slopes of the Himalayas to the plains of India, though locally migratory with the seasons. It is not often found in dense forests, though one may occasionally be seen hovering over a glade in the midst of a dense jungle.

This beautiful little hawk is very often most confident and will permit one to sit down within a few paces of its perch and watch it searching for its prey. Like the Merlin, the head is always bobbing up and down, as it focusses its eyes on to some tiny tuft of grass or on some movement. Silently and slowly it will leave its perch and fly down with half bent wings until within a couple of feet of the object of its attack, when it will suddenly put on a spurt and fairly dash on to the ground. Its movements depend on the nature of its quarry. Sometimes a Kestrel will be seen dropping from the skies at a terrific pace with no attempt to check its stoop until it apparently actually hits the ground, whereas a few minutes later the same bird will be seen to come down very gently, with extended wings and alight with the utmost caution. A grass hopper crawling up a blade of grass, or along the



ground, calls for no haste, whereas a mole cricket, or a lizard, may find a hole to disappear into any moment, and requires speedy attention.

It is by watching the "hoverers" (the Osprey, The Short-Toed Eagle, the Black-winged Kite ~~and~~ the Kestrel) that one begins to realise what marvellous eyesight the birds of prey are gifted with. When one sees a Kestrel hovering some 500 ft. above the earth and sees it drop to rise again with nothing visible in its talons, and as it flies slowly up one notices the head bend down and the claws come forward to meet the head and a couple of tiny, semi-transparent wings flutter to earth, one knows that the object which attracted the attention of those wonderful eyes, from such a height, was not much bigger than one's thumb nail, it leaves one wondering and marvelling.

The Kestrel makes a delightful little pet, and has been trained to catch sparrows and other small birds. It will come readily to a quail behind a net, but its food consists almost entirely of insects, lizards and mice, and in its wild state it very seldom attacks birds. That birds pay little or no attention to one hovering in their immediate vicinity is proof that they do not consider it an enemy.

It builds in cliffs, in the Himalayas, very often in deep holes and lays 4 or 5 eggs "brick to blood red, mottled and blotched with a deeper colour, and measuring about 1.57 by 1.21" (Blanford).

*(To be concluded in the next number.)*

# SUMMARY OF THE RESULTS FROM THE INDIAN MAMMAL SURVEY

## OF THE BOMBAY NATURAL HISTORY SOCIETY.

By R. C. WROUGHTON, F.Z.S.

### PART VII.

(Continued from page 85 of this Volume.)

#### Family II.—CERVIDÆ.

Two subfamilies are recognised which may be distinguished as follows:—

#### *Key to the subfamilies of the CERVIDÆ.*

- A.*—Antlers, face, glands, and foot glands  
(at least in hind limbs) present; no  
caudal gland ... .. I. CERVINÆ.  
*B.*—Antlers, face-glands, and foot-glands  
absent; a caudal gland in male ... II. MOSCHINÆ.

#### Subfamily I.—CERVINÆ.

Lydekker recognises only two genera, one of which however he subdivides, into six subgenera. Thomas supports me in holding that all these subgenera should be treated as full genera. One of them is not represented in our region, but the remaining six may be arranged in a key as follows:—

#### *Key to the genera of the CERVINÆ.*

- I.—Upper canines tusk-like in males;  
horns short; pedicels as long as  
horns, or longer, and continued down-  
wards as prominent converging  
frontal ridges; no phalanges to  
lateral digits ... .. I. MONTIACUS.  
II.—Upper canines (when present) not  
tusk-like; long horns on short pedi-  
cels, which are not produced down-  
wards on the face; bony phalanges  
present in lateral digits.  
*A.*—A specialised gland forming a mo-  
derately deep cleft on front of  
hind pasterns; antlers three-tined;  
tail long.

- a. Size larger; gland cleft on hind pasterns without long hairs; coat spotted at all seasons ... II. AXIS.
    - b. Size smaller; gland cleft on hind pasterns, lined with long hairs; coat spotted, at most, in summer ... III. HYELAPHUS.
  - B.—No specialised gland, or deep cleft, on front of hind pasterns; upper canines usually present.
    - a. Muffle extending some distance below the nostrils; antlers normally three-tined; tail relatively long and bushy, coat unicolorous ... IV. RUSA.
    - b. Muffle scarcely extending below nostrils; tail short.
      - a<sup>1</sup>. Antlers typically dichotomously forked, with at least four tines; no light rump-patch ... V. RUCERVUS.
      - b<sup>1</sup>. Antlers usually five-tined; a light rump-patch or area on back of hams ... VI. CERVUS.

#### Gen. I.—MUNTIACUS.

This name was given by Rafinesque in 1815, a year earlier than Blainville's CERVULUS.

No. 362, *muntjac*, Zimm. I re-examined this group recently, No. 363, *feæ*, Thos.& Dor. (J. B. N. H. S. xxiv, p. 42, 1915), and decided to recognize four species excluding *feæ*. These five species may be arranged in a key as follows:—

#### Key to the species of MUNTIACUS.

- A.—Upper surface of tail rufous or fulvous.
  - a. Grizzling not extending backwards beyond the shoulders.
    - a<sup>1</sup>. General colour tawny ochraceous. 1. *grandicornis*, Lyd.
    - b<sup>1</sup>. General colour bright chestnut. 2. *vaginalis*, Bodd.
  - b. Grizzling extending backwards over back.
    - a<sup>1</sup>. General colour ochraceous buff. 3. *aureus*, H. Sm.
    - b<sup>1</sup>. General colour hazel ... 4. *malabaricus*, Wr.
- B.—Upper surface of tail black ... 5. *feæ*, Thos. & Dor.



## DISTRIBUTION :—

1. *M. grandicornis*, Lydekker. *Type locality* :—Amherst District Burma. (Allen).  
*Other localities* :—Lower Chindwin ; Shan States (B. M.) ; Chin Hills ; Chindwin ; Mt. Popa ; Shan States ; Tenasserim (M. S. I.).  
*Type* :—B. M. No. 4.9.23.1.
2. *M. vaginalis*, Boddëert. *Type locality* :—Bengal.  
*Other localities* :—Kumaon ; Nepal ; Sikkim ; Garo Hills (B. M.) ; Sikkim ; Bhutan Duars ; Chindwin (M. S. I.).  
*Type* :—Unknown. (Co-types of *ratwa*, Hodgson, B. M. No. 43.1.12.123 and 43.1.26.13. ; Lectotype B. M. No. 43.1.12.123.)
3. *M. aureus*, Hamilton Smith. *Type locality* :—Unknown.  
*Other localities* :—Dekhan (Sykes) ; (B. M.) ; Central Provinces ; Berars ; Kumaon (M. S. I.).  
*Type* :—Unknown. (Type of *tamulicus*, Gray, B. M. No. 701. b., skull only).
4. *M. malabaricus*, Wroughton. *Type locality* :—Nagarhol, Coorg. (B. N. H. S.—Shortridge).  
*Other localities* :—Kanara ; Coorg ; Ceylon (M. S. I.).  
*Type* :—B. M. No. 13.8.22.103.
5. *M. feæ*, Thomas & Doria. *Type locality* :—Mt. Muleyit, Burma. (Fea).  
*Other localities* :—S. W. Siam (B. M.).  
*Type* :—Genoa Museum.

## Gen. II.—AXIS.

No. 368. *axis*, Erxl. \* Lydekker admits a subspecies for Ceylon, which may be distinguished from the peninsular form as follows :—

*Key to the subspecies of AXIS AXIS.*

- A.—Antlers stouter ; spots larger ; forehead usually with a dark chevron and a few white spots ... 1. *a. axis*, Erxl.
- B.—Antlers lighter ; spots smaller ; forehead uniformly brown ... 2. *a. ceylonensis*, Fitz.

## DISTRIBUTION :—

1. *A. axis axis*, Erxleben. *Type locality* :—Peninsular India.  
*Other localities* :—Berars; Central Provinces; Kanara; Oudh; Rohilkund; Kumaon; Bengal; Nepal; Sikkim (B. M.); Central Provinces; Kanara; Coorg (M. S. I.).  
*Type* :—Unknown. (Type of *nudipalpibra*, Ogilby, B. M. No. 693. i.)
2. *A. axis ceylonensis*, Fitzinger. *Type locality* :—Ceylon.  
*Other localities* :—Ceylon (B. M.); Ceylon (M. S. I.).  
*Type* :—Unknown (Type of *zeylanicus*, Lydekker, B. M. No. 5.5.18.1.)

## Gen. III.—HYELAPHUS.

- No. 369. *porcinus*, Zimm. The only form in our area.

## DISTRIBUTION :—

- H. porcinus*, Zimmermann. *Type locality* :—Indo-Gangetic Plain.  
*Other localities* :—Kumaon; Rohilkund; Nepal; Sikkim; Bengal; Garo Hills; Burma (B. M.).  
*Type* :—Unknown.

## Gen. IV.—RUSA.

- No. 367. *unicolor*, Kerr. Lydekker accepts a number of subspecies, of which however only one actually belongs to our area. A second is recorded from Sze Chuen, and may later be found in N. E. Burma so I have included it here. Lydekker distinguishes the two as follows :—

*Key to the forms of RUSA.*

- A.—Size rather larger; face longer;  
 shanks dark ... 1. *u. unicolor*, Kerr.
- B.—Size slightly smaller; face shorter;  
 shanks light... 2. *u. dejeani*, Pous.

## DISTRIBUTION :—

1. *R. unicolor unicolor*, Kerr. *Type locality* :—Ceylon.  
*Other localities* :—Mhow; Godavery Valley; Kumaon; Oudh; Nepal; Sikkim (B. M.); Western Ghats Dharwar; Coorg; Ceylon; Kumaon Bhutan Duars (M. S. I.).  
*Type* :—Unknown.

2. *R. unicolor dejeani*, Type locality :—Sze Chuen.  
 Pousargues. Other localities :—No specimen in  
 B. M.  
 Type :—Paris Museum.

## Gen. V. RUCERVUS.

No. 365. *duvaucelli*, Cuv. Lydekker accepts two subspecies of  
 No. 366. *eldi*, McCl. *eldi* for our region, viz., *eldi*, and  
*frontalis*, from S. Burma and Manipur  
 respectively. Thomas has more recently studied this group (J. B.  
 N. H. S. xxv, p. 364, 1918). He shows that the original of *eldi*  
 came from Manipur and not from Pegu, and that consequently  
 that name must be used for the form now called *frontalis*. The  
 true Thamin of Pegu being thus without a name, he proposes for it  
 that of *thamin*, at the same time raising it to specific rank alongside  
 of *eldi*; finally he establishes a subspecies of *thamin*, viz., *brucei*,  
 for the animal from the Ruby Mines, Burma. The four forms of  
 RUCERVUS (including *duvaucelli*) may be arranged in a key as  
 follows :—

*Key to the species of RUCERVUS.*

- A.—Brow tine differentiated from the  
 beam, leaving it at an appreciable  
 distance above the burr ... 1. *duvaucelli*, Cuv.  
 B.—Brow tine continuous with the beam,  
*i.e.*, leaving it immediately above the  
 burr.  
 a. Under surface of hind pasterns  
 horny ... 2. *eldi*, McClelland.  
 b. Under surface of hind pasterns  
 hairy.  
 a<sup>1</sup>. Antlers spreading widely outwards  
 almost from the burr ... 3. *t. thamin*, Thos.  
 b<sup>1</sup>. Antlers rising parallel for an ap-  
 preciable distance, and then only  
 spreading feebly outwards ... 4. *t. brucei*, Thos.

## DISTRIBUTION :—

1. *R. duvaucelli*, Cuvier. Type locality :—Plains of India.  
 Other localities :—Central Provinces;  
 Kheri, Oudh; Kumaon; Nepal;  
 Brahmaputra Valley; Gauhati, Assam  
 (B. M.).  
 Type :—Unknown. (Type of *ela-*  
*phoides*, Hodgson, B. M. Nos. 45.1.8,  
 128-131.; Type of *dimorphe*, Hodgson,



- B. M. No. 45.1.8.271; Type of *lyratus*, Schinz, Ind. Mus. Calc. No. f.).
2. *R. eldi*, McClelland. Type locality :—Manipur. (Eld).  
Other localities :—Manipur (B.M.).  
Type :—Not traced. (Co-types of *frontalis*, McClelland, B. M. No. 79. 11.21.36. and Ind. Mus. Calc. Nos. *b.* and *c.*; Type of *cornipes*, Lydekker, B. M. No. 1.17.13.1).
3. *R. thamin thamin*, Thomas. Type locality :—Pegu. (Evans).  
Other localities :—Lower Chindwin; Pegu; Thatone, Tenasserim (B. M.).  
Type :—B. M. No. 0.7.23.1.
4. *R. thamin brucei*, Thomas. Type locality :—Ruby Mines, Burma. (Bruce).  
Other localities :—Ruby Mines.  
Type :—B. M. No. 17.7.8.17.

#### Gen. VI.—CERVUS.

No. 364. *cashmirianus*, Falc. Lydekker adds two more forms which occur either within our region; or on its immediate border. These three may be arranged in a key as follows :—

#### Key to the species of CERVUS.

- A.—Muzzle mainly dark, lower lips and chin fawn or brown; ears long and pointed, with sinuous upper margins.
- a. A white rump patch; antlers five-tined, sharply angulated and bent forward at the third tine, so that the tips of the fifth are bent inwards. 1. *affinis*, Hodgs.
- b. White area restricted to back of hams; a brownish patch on croup, in front of tail; antlers wapiti like. 2. *macneilli*, Lyd.
- B.—Muzzle pale fawn, lower lip and chin white; ears bluntly pointed, with straight upper margins ... 3. *hanglu*, Wagn.

#### DISTRIBUTION :—

1. *C. affinis*, Hodgson. Type locality :—Chambi Valley; Sikkim (Hodgson).  
Other localities :—Chambi Valley; Bhutan (B. M.).  
Type :—B. M. No. 45.1.8.94.

2. *C. macneilli*, Lydekker. *Type locality*:—Sze Chuen. (Macneill).  
*Other localities*:—None.  
*Type*:—B. M. No. 9.5.31.1.
3. *C. hanglu*, Wagner. *Type locality*:—Kashmir.  
*Other localities*:—Kashmir (B. M.).  
*Type*:—Unknown. (Type of *cashmeirianus*, Falconer, B. M. No. 46.8.24.2.).

## Subfamily II.—MOSCHINÆ.

## Gen.—MOSCHUS.

- No. 370. *moschiferus*, L. The only Indian genus.  
 The only species.

## DISTRIBUTION:—

- M. moschiferus*, Linnæus. *Type locality*:—"Tataria *versu* ; Chinam."  
*Other localities*:—Kashmir; Garwhal, Nepal; Sikkim; Cachar (B. M.); Sikkim (M. S. I.).  
*Type*:—Unknown. (Type of *chrysogaster*, Hodgson, B. M. No. 43.1.12.93.; Type of *leucogaster*, Hodgson, B. M. No. 43.1.12.95; Type of *cachariensis*, Hodgson, B. M. No. 43.1.12.97; Type of *saturatus*, Hodgson B. M. No. 43.1.12.98).

## Section II.—TRAGULINA.

There is only one Family.

## Family.—TRAGULIDÆ.

Thomas has recently (A. M. N. H. (8) xviii, p. 72, 1916) restricted the name TRAGULUS to the unspotted forms of Malaya, and revived Hodgson's MOSCHIOLA for the spotted peninsular form. These two genera may be distinguished as follows:—

*Key to the genera of the TRAGULIDÆ.*

- A.—Body spotted; chin and throat hairy.. I. MOSCHIOLA.  
 B.—Body not spotted; skin between rami  
 of mandibles naked ... .. II. TRAGULUS.

## Gen. I.—MOSCHIOLA.

- No. 371. *meminna*, Erxl. The only species.

DISTRIBUTION :—

*M. meminna*, Erxleben.

*Type locality* :—India.

*Other localities* :—Dekhan; Kanara; Mysore; Coorg; Travancore; Ceylon (B. M.); Kanara; Coorg; Ceylon (M. S. I.).

*Type* :—Unknown. (Type of *malaccensis*, Gray, B. M. No. 42.5.26.19).

Gen. II.—TRAGULUS.

No. 372. *javanicus*, Gmel.

Two forms are found in Burma, a

No. 373. *napu*, Raff.

large and a small, for which Blanford borrows names from Java and Suma-

tra, but more recently Miller has provided the names *ravus* and *canescens*, (Proc. Biol. Soc. Wash. xiii, p. 185, 1900, and xv, p. 173, 1902). They may be distinguished as follows :—

*Key to the species of* TRAGULUS.

A.—Size smaller, head and body about

18-19 inches, hind foot 4.5-5 inches ... 1. *ravus*, Mill.

B.—Size larger, head and body about 25-

30 inches; hind foot 5.5-6 inches ... 2. *canescens*, Mill.

DISTRIBUTION :—

1. *T. ravus*, Miller.

*Type locality* :—Trong, S. W. Siam (Abbott).

*Other localities* :—Tenasserim (B. M.); Tenasserim (M. S. I.);

*Type* :—U. S. Nat. Mus. No. 83506.

2. *T. canescens*, Miller.

*Type locality* :—Trong, S. W. Siam (Abbott).

*Other localities* :—Tenasserim (B. M.); Tenasserim (M. S. I.).

*Type* :—U. S. Nat. Mus. No. 83509.

Section III.—SUINA.

Only one Family is represented.

Family—SUIDÆ.

Two genera are represented which may be distinguished as follows :—

*Key to the genera of the* SUIDÆ.

A.—Size large, height 20-40 inches at the

shoulder; tail fairly long; mammæ 12. I. SUS.

B.—Size small, height 10 inches at

shoulder; tail short; mammæ 6. II. POCULA.



## Gen. I.—SUS.

No. 374. *cristatus*, Wagn. Miller has founded the name

No. 375. *andamanensis*, Bl. *jubatus* for the Tenasserim pig, and  
*nicobaricus* for the form from the

Nicobars. These may be arranged in a key as follows:—

*Key to the forms of SUS.*

A.—Size larger; 30-40 inches at shoulder;  
face not banded; last molar complex.

a. Larger; ears long and haired ... 1. *c. cristatus*, Wagn.

b. Size smaller, ears shorter; nearly  
naked ... 2. *c. jubatus*, Mill.

B.—Size smaller, about 20 inches at  
shoulder; face banded; last molar  
simple.

a. Upper tooth row 83mm. ... 3. *andamanensis*, Bl.

b. Upper tooth row 95mm. ... 4. *nicobaricus*, Mill.

## DISTRIBUTION:—

1. *S. cristatus cristatus*,  
Wagner.

*Type locality*:—Malabar.

*Other localities*:—Central Provinces;  
Nilgiri Hills; Malabar; Nepal; Sik-  
kim (B. M.); Kathiawar; Western  
Ghats; Dharwar; Bellary; Coorg;  
Ceylon; Bhutan Duars; Chindwin  
(M. S. I.).

*Type*:—Unknown. (Type of *affinis*,  
Gray, B. M. No. 38.3.13.48; Type  
of *zeylonensis*, Blyth, Ind. Mus. Calc.,  
No. p. )

2. *S. cristatus jubatus*,  
Miller.

*Type locality*:—Trong, S. W. Siam  
(Abbott).

*Other localities*:—None.

*Type*:—U. S. Nat. Mus. No. 83518.

3. *S. andamanensis*, Blyth.

*Type locality*:—Port Blair, Andaman.

*Other localities*:—Andaman (B.M.).

*Type*:—Not traced.

4. *S. nicobaricus*, Miller.

*Type locality*:—Great Nicobar  
Island. (Abbott.)

*Other localities*:—No specimens in  
B. M.

*Type*:—U. S. N. Mus. No. 111, 794.

## Gen. II.—PORCULA.

No. 376. *salvanius*, Hodgs. The only species.

## DISTRIBUTION :—

*P. salvania*, Hodgson.*Type locality* :—Sikkim (Hodgson).*Other localities* :—Sikkim (B. M.)*Type* :—B. M. No. 58. 6. 24. 72.

## Suborder II.—PREISSODACTYLA.

Blanford recognises three Families which he distinguishes as follows :—

*Key to the families of the PERISSODACTYLA.*

A.—Only one digit developed on each foot. I. EQUIDÆ.

B.—More than one digit on each foot.

a. Three digits on each foot ... II. RHINOCEROTIDÆ.

b. Four digits on each foot ... III. TAPIRIDÆ.

## Family I.—EQUIDÆ.

Gen.—EQUUS.

The only genus represented in India.

No. 333. *hemionus*, Pall. There are two forms in our area or on its borders which may be distinguished as follows :—

*Key to the species of EQUUS.*

A.—Larger height about 4ft. 3 ins. ; hoofs

wide, over 75mm. ... 1. *kiang*, Moore.

B.—Smaller height about 3ft. 10 ins. ;

hoofs narrow, under 62mm. ... 2. *o. indicus*, Matsc.

## DISTRIBUTION :—

1. *E. kiang*, Moorcroft.*Type locality* :—Ladak.*Other localities* :—Ladak ; Nepal (B. M.).*Type* :—Unknown. (Type of *polyodon*, Hodgson, B. M. No. 48.6.11.16).2. *E. onager indicus*, Matschie.*Type locality* :—Kach.*Other localities* :—Kach ; Sind ; Baluchistan (B. M.).*Type* :—Unknown.

## Family II.—RHINOCEROTIDÆ.

Gen.—RHINOCEROS.

This, the only genus represented in our area, is divided into two subgenera as follows :—

*Key to the subgenera of RHINOCEROS.*

A.—A single horn on nose ... I. RHINOCEROS.

B.—Two horns on nose ... II. DICERORHINUS.

Subgen. I.—RHINOCEROS.

No. 334. *unicornis*, L.      These two species may be dis-  
No. 335. *sondaicus*, Desm.    tinguished as follows:—

No. 335. *sondaicus*, Desm.

*Key to the species of* RHINOCEROS (RHINOCEROS).

A.—Fold in front of the shoulder not continued over the back of neck; skin of sides bearing tubercles... 1. *unicornis*, L.

*B.*—Fold in front of shoulder continued over back of neck; skin of sides divided into small polygonal scales. 2. *sondaicus*, Desm.

DISTRIBUTION :—

1. *R. (R). unicornis*, Lin- *Type locality*:—Assam.  
næus. *Other localities*:—Assam; Nepal  
(B. M.).  
*Type*:—Unknown. (Type of *steno-*  
*cephalus*, Gray, B. M. No. 722. e.).
2. *R. (R) sondaicus*, Des- *Type locality*:—Sumatra. (Diard and  
marest. Duvaucal).  
*Other localities*:—Cochin China;  
Malay Peninsula; Sumatra; Java;  
Borneo (B. M.).  
*Type*:—Unknown. (Type of *nasalis*,  
Gray, B. M. No. 59. 8. 16. 1.).

2. *R. (R.) sondaicus*, Des-  
marest. *Type locality*:—Sumatra. (Diard and  
Duvaucel).  
*Other localities*:—Cochin China;  
Malay Peninsula; Sumatra; Java;  
Borneo (B. M.).  
*Type*:—Unknown. (Type of *nasalis*,  
Gray, B. M. No. 59. 8. 16. 1.).

Subgen. II.—DICERORHINUS.

In 1901 Thomas grudgingly accepted *lasiotis*, Sclater, as a subspecies of *sumatrensis* (P. Z. S. ii, p. 154), solely on its larger size. Lydekker also keeps the two forms separate, and Sclater in his Catalogue of the Indian Museum, Calcutta, distinguishes them as follows:—

*Key to the forms of* RHINOCEROS (DICERORHINUS).

*A.*—Skull narrow; tooth-row short . . . 1. *s. sumatrensis*, Cuv.

*B.*—Skull broader; tooth-row longer ... 2. *s. lasiotis*, Scl.

DISTRIBUTION :—

1. *R. (D). sumatrensis sum-* Type locality :—Sumatra.  
*atrensis*, Cuvier. Other localities :—Pegu; Malay  
 Peninsula; Borneo (B. M.).  
 Type :—Unknown. (Type of *niger*,  
 Gray, B. M. No. 72.12.31.1.).
2. *R. (D). sumatrensis las-* Type locality :—Chittagong.  
*iotis*, Sclater. Other localities :—None.  
 Type :—B. M. No. 1. 1. 22. 1.

2. *R. (D). sumatrensis lasiotis*, Sclater.  
Type locality :—Chittagong.  
Other localities :—None.  
Type :—B. M. No. 1. 1. 22



## Family III.—TAPIRIDÆ.

There is only one genus recognised but Lydekker, accepts ACROCODIA (Goldman), as a subgenus to contain the Indian forms.

Gen.—TAPIRUS.

Sub-genus.—ACROCODIA.

No. 337. *indicus*, Cuv. The only species.

DISTRIBUTION :—

*T. (A). indicus*, Cuvier. *Type locality* :—Malay Peninsula.  
*Other localities* :—Malay Peninsula ;  
 Sumatra (B. M.).  
*Type* :—Unknown.

## Suborder III.—PROBOSCIDEA.

Gen.—ELEPHAS.

The only genus.

No. 332. *maximus*, L. Thomas (P. Z. S. p. 101, 1911.), points out that Linnaeus himself gives the type locality of *maximus* as Ceylon. Lydekker however asserts that there are two races of elephants in Ceylon, an indigenous and an imported, and holds that it was on one of the latter that the name was based. He thus recognises two forms which he distinguishes as follows:—

*Key to the forms of ELEPHAS.*

A.—Tusks large ...	...	...	1. <i>m. maximus</i> , L.
B.—Tusks insignificant ...	...	...	2. <i>m. zeylanicus</i> , Blainv

DISTRIBUTION :—

1. <i>maximus maximus</i> , Linnaeus.	<i>Type locality</i> :—Doubtful, probably S. India. <i>Other localities</i> :—No specimens. <i>Type</i> :—Unknown.
2. <i>E. maximus zeylanicus</i> , Blainville.	<i>Type locality</i> :—Ceylon. <i>Other localities</i> :—No specimens. <i>Type</i> :—Unknown.

## Order VIII.—EDENTATA.

The only Suborder (of several recognised) represented in India is the SQUAMATA.

Suborder.—SQUAMATA.

Only one of several Families is found in our area.

Family.—MANIDÆ.

There is only one genus.

## Gen.—MANIS.

Blanford was mistaken in placing the name *pentadactyla*, as representing the common Pangolin, for that name is an older synonym of *aurita*, consequently *crassicaudata*, Geoff., must be substituted for it, while it takes the place assigned by him to *aurita*. With these changes of names Blanford's key stands as follows :—

*Key to the species of MANIS.*

- A.—Fore-claws about twice the length of hind-claws.  
 a. 11 to 13 rows of scales round the body ... 1. *crassicaudata*, Geoff.  
 b. 15 to 19 rows of scales round body... 2. *pentadactyla*, L.  
 B.—Fore-claws but little longer than hind-claws ... 3. *javanica*, Desm.

## DISTRIBUTION —

1. *M. crassicaudata*, Geoffroy. *Type locality* :—India.  
*Other localities* :—Shevaroy Hills; Madras; Kandy; Ceylon; Bengal (B. M.); Cutch; Kanara; Bellary; Mysore; Coorg; Ceylon; Bengal (M. S. I.).  
*Type* :—Unknown.  
 2. *M. pentadactyla*, Linnaeus. *Type locality* :—Formosa.  
*Other localities* :—Nepal; Sikkim (B. M.); Mt. Popa; Pegu (M. S. I.).  
*Type* :—Unknown. (Type of *aurita*, Hodg. B. M. No. 43.1.12.85).  
 3. *M. javanica*, Desmarest. *Type locality* :—Java.  
*Other localities* :—Bankasun; Tenasserim (B. M.).  
*Type* :—Perhaps in Paris Museum.

## Order IX.—CETACEA.

## Order X.—SIRENIA.

I have found no record of recent work, on Indian material, in these two groups, and have omitted them entirely from this Summary.

(To be continued.)

BOMBAY NATURAL HISTORY SOCIETY'S  
MAMMAL SURVEY OF INDIA, BURMA, AND CEYLON.

REPORT No. 32, BALUCHISTAN.

BY R. C. WROUGHTON, F.Z.S.

COLLECTION	...	...	No. 32.
LOCALITY	...	...	Baluchistan.
DATE	...	...	January 1916 to July 1918.
COLLECTED BY	...	...	Col. J. E. B. Hotson.
EARLIER REPORTS :—	..	..	For previous reports, see, Vol. XXVI., p. 1025, 1920.

This fine Collection was made by Col. J. E. B. Hotson (assisted to some extent by the Society's Taxidermist, N. A. Baptista) in British Baluchistan.

This area is not strictly part of "India" proper either geographically or zoologically but as the collection completes the linking up of the Indian with the West Asian (Persian, Arabian, &c.) fauna, already foreshadowed in the Sind Collection (No. 24) it deserves a place in the Survey.

Broadly the eastern half of British Baluchistan, made up to a great extent, of part of the Khalat State and the Las Beyla State. Its principal feature is the Central Brahui and Pab Ranges, running North and South, and forming a central ridge. The western half may be again subdivided into a northern and southern half, the latter the Mekran, from the sea to the Siahan Mountain Range, with several lesser parallel ranges between. The country north of the Siahan Range is understood to be for the most part uninhabited desert and is not represented in this Collection.

Four of the eight forms of bat obtained are Sind species but have not so far been taken further south in India. Among the Insectivora, both species of Hedgehog and the *Crocidura* belong to the frontier. The panther is of course found throughout India, and so is the Wolf (*C. pallipes*). The Mongoose is identical with the Sind form, as also probably is the Jackal. The Mottled Polecat (*V. peregrusna*) is a local form of the frontier, and so is the Hoary Fox (*V. cana*); while the common fox of the country (*V. persica*) though distinct from *leucopus* is very closely allied to it.

Among the Rodents the Banyan Squirrels *Funambulus* and Gerbils *Tatera sherrini* are identical with north Indian forms. But the rest for the most part are specifically and in many cases generically distinct from any forms found in India proper. The House-mouse *Mus bactrianus* appears to be distributed all over Baluchistan, and to differ specifically from the Punjab or Sind



form, but, so far as can be gathered from this very full collection, the House-rat is entirely absent from the country, being only found, evidently introduced by shipping, at or close to marine ports.

In the Collection are represented 44 forms included in 34 genera and as might be expected on the border-land of transition from one Fauna to another it has been found necessary to give quite a number of new names to intermediate forms, but from the point of view of novelty by far the most interesting, are the two forms of the Vesper Mouse *Calomyscus* (*hotsoni* and *baluchi*), a genus intimately related to the New World *Peromyscus* by the form of its teeth. A single specimen of another species (*bailwardi*) of the genus was taken at Mali-i-Mir, 70 miles N. E. of Ahwas, Persia, by Col. Bailward and Mr. R. B. Woosnam, and these three species form a small group without any intermediate forms either structurally or geographically between them and the American *Peromyscus*.

The following list shows the new species and subspecies found in this collection :—

- (1) *Myotis lanaceus*.
- (2) *Paraechinus amir*.
- (3) *Crocidura portali*.
- (4) *Allactaga hotsoni*.
- (5) *Cheliones hurrianæ collinus*.
- (6) *Meriones persicus*.
- (7) *Calomyscus baluchi*.
- (8) *Calomyscus hotsoni*.
- (9) *Ochotona rufescens vulturina*.

(1) ROUSETTUS ARABICUS, And. & deWint.

*The Arabian Rouset.*

1871. *Cynonycteris amplexicaudata* (nec GEOFF) Dobson. Cat. Chir Ind. Mus. p. 2.  
 1891. *Xantharpyia amplexicaudata*, Blanford. Mamm. No. 137.  
 1892. *Rousettus arabicus*, And. & deWint. Zool. Egypt p. 86 & seq.  
 Panjgur, ♂ 12, ♀ 11.

(2) ASELLIA TRIDENS MURRAIANA, K. And.

*The Sind Trident Leaf-nose.*

1813. *Rhinolophus tridens*, Geoffroy. Descr. d' Egypte, II, p. 130.  
 ? *Phyllorhina tridens murraiana*, Anderson. Car. p. 113.  
 1891. *Hipposiderus tridens*, Blanford. Mamm. No. 158.  
 Panjgur, ♀ 21, ♂ 1.

(3) HIPPOSIDEROS FULVUS PALLIDUS, K. And.

*The Sind Leaf-nose.*

1891. *Hipposiderus bicolor*, Blanford. Mamm. No. 166.  
 1918. *Hipposideros fulvus pallidus*, K. Anderson. A. M. N. H. 9, II, p. 831.  
 Panjgur, ♂ 1.

(4) *EPTESICUS NASUTUS*, Dobs.

*The Sind Serotine.*

1877. *Vesperugo nasutus*, Dobson. J. A. S. B. XLVI., pt. 2, p. 311.

1891. *Vesperugo nasutus*, Blanford. Mamm. No. 175.

Rajbar, ♀ 1.

This species was described from Sind, but is as yet unrepresented in the British Museum.

The present specimen has had its skull broken, so that its relationship is not certain, but it is probably *E. nasutus*, and would also seem to be nearly allied to the Western Persian bat, *Eptesicus pellucens*. Thos. originally described as a subspecies of *E. matschiei* of Aden, from its Persian ally however it may be distinguished by its more uniformly coloured membranes without the prominent white edging and peculiar transparency found in *pellucens*. These details were kindly furnished by Mr. Thomas.

(5) *PIPISTRELLUS KUHLI LEPIDUS*, Blyth.

*The Kandahar Pipistrel.*

(Synonymy in No. 24).

Panjgur, ♂ 5; Nag. ♂ 2, ♀ 1; Kalgai Jaur, ♂ 1.

(6) *MYOTIS LANACEUS*, Thos.

*The Woolly Mouse-ear.*

1919. *Myotis lanaceus*, Thomas. J. B. N. H. S. XXVI, p. 933.

Shastun nr. Dizak, Persian Baluchistan, ♀ 1.

The publishing of the name as *lanceus* was obviously a misprint.

(7) *RHINOPOMA MICROPHYLLUM*, Geoff.

*The Egyptian Mouse-tail.*

1812. *Rhinopoma microphyllum*, Geoffroy. Decsr. d' Egypte, II., p. 123.

Las Beyla, ♀ 2.

(8) *RHINOPOMA PUSILLUM*, Thos.

*The Slender Mouse-tail.*

1920. *Rhinopoma pusillum*, Thomas. J. B. N. H. S. XXVII., p. 25.

Sib., ♀ 1 (in al).

(9) *RHINOPOMA*, sp.

Ispid Lamin, Persian Baluchistan, ♂ 1. (juv).

The specimen is too young for certain identification, all the more so that there are at least three species which may be represented in this locality.

(10) *HEMIECHINUS MEGALOTIS*, Blyth.

*The Large-eared Hedge-hog.*

1845. *Erinaceus megalotis*, Blyth. J. A. S. B. XIV., p. 353.

1891. *Erinaceus megalotis*, Blanford. Mamm. No. 105.

Mastung, ♂ 2, ♀ 3; Sorab, ♂ 1, ♀ 1; Shahdadgi, ♂ 1;

Khojdar, ♂ 1; Mazaryib, ♀ 2.

An interesting series of a species hitherto very insufficiently represented. Type locality, Kandahar.

(11) *PARAECHINUS AMIR*, Thos.

*The Afghan Hedge-hog.*

19. *Paraechinus amir*, Thomas. A. M. N. H. (8) I., 1918. p. 230.

Sib, ♂ 1, ♀ 1; Chahabar, ♀ 1; Chib, ♂ 1; Panjgur, ♀ 2.

This species is no doubt very closely allied to *P. macracanthus*, Blanf., but besides the skull differences mentioned in Thomas's description—some of which prove to be rather variable—this series shows that *amir* may be distinguished from *macracanthus* by its blackish belly and chest.

(12) *CROCIDURA PORTALI*, Thos.

*Portal's Shrew.*

19. *Crocidura portali*, Thomas. A. M. N. H. (9) V., 1920. p. 119.

Kelat, ♀ 1; Turbat Kech, ♂ 1, ♀ 1; Panjgur, ♂ 1.

These shrews vary very considerably in colour, though they agree in being much lighter than most other members of the genus.

On the whole they seem best referable to the little *C. portali* recently described from Palestine, but as this involves their occurrence right across Persia and Syria, the reference should for the present be looked upon as provisional.

They are also related to, but paler than, the central Asian *C. ilensis*, Miller.

(13) *FELIS PARDUS*, L.

*The Panther.*

(Synonymy in No. 5.)

Perso-Baluch Border? 1.

(14) *HERPESTES EDWARDSI FERRUGINEUS*, Blanf.

*Blanford's Indian Mongoose.*

(Synonymy in No. 24.)

Mand, ♂ 1; Jumajgi, ♀ 1; Panjgur, ♂ 1, ♀ 2; Gebri, ♂ 1;  
Quarquarsdan, ♀ 1; Geh, ♂ 1.

Some of the specimens look rather grey but one at least from Quarquarsdan is as highly coloured as any from Sind.

(15) *VORMELA PEREGUSNA*, Gueld.

*The Mottled Polecat.*

1770. *Mustela peregusna*, Gueldenstaedt. Nov. Comm. Acad. Sci. Imp. Petrop., XIV., p. 441.

1891. *Putorius sarmaticus*, Blanford. Mamm. No. 80.

Kanak, 1 cured flat skin, no skull.

(16) *CANIS AUREUS*, Linn.

*The Jackal.*

(Synonymy in No. 1.)

Mastung, ♀ 1; Khojdar, ♂ 1; Panjgur, ♂ 4, ♀ 1.

When working out the Indian Jackals I purposely left out the northern form until we knew more of true *aureus* from the Persian Gulf. These must similarly wait, and for the present go under the name *aureus*.



(17) CANIS PALLIPES, Sykes.

*The Indian Wolf.*

(Synonymy in No. 3.)

Khòjdar, ♂ 1. (juv).

(18) VULPES PERSICA, Blanf.

*The Persian Fox.*

1875. *Vulpes persicus*, Blanford. A. M. N. H. ser. XIV., p. 310.

*Vulpes persicus*, Blanford. Eastern Persia., II., p. 39.

Mand, ♂ 1, ♀ 1; Shirwan, ♀ 1; Bamgour, ♀ 1, ? 1.

Chaharbar, ♂ 1; Gwarpuski, ♀ 1; Panjgur, ♂ 1, ♀ 3;

Sor Kilkaju, ♀ 1; Kojdar, ♀ 1; Wakir, ♀ 1; Wadh, ♂ 1;

Nasirabad, ♀ 1.

(19) VULPES CANA, Blanf.

*The Hoary Fox.*

1877. *Vulpes canus*, Blanford. J. A. S. B. XLV., pt. 2., p. 321.

1888. *Vulpes cana*, Blanford. Mamm. No. 73.

Turbat Kech, ♂ 1.

(20) FUNAMBULUS PENNANTI ARGENTESCENS, Wrought.

*The Sind Banyan Squirrel.*

(Synonymy in No. 24.)

Gajar, ♂ 1, ♀ 1; Kelat, ♀ 1; Geh, ♂ 1; Turbat Kech, ♂ 3, ♀ 3;

Panjgur, ♀ 2; Turbat, ♂ 3, ♀ 1; Mand, ♂ 4; Noding, ♂ 1.

We have recently seen so much of seasonal variation in this genus that I hesitate to add a new name, but as almost might have been expected these specimens are much more coldly coloured than any from further south.

(21) ALLACTAGA INDICA, Gray.

*The Afghan Jerboa.*

1842. *Allactaga indica*, Gray. A. M. N. H. X., p. 262.

1863. *Alactaga bactriana*, Blyth. Cat. Mamm., p. 110.

1891. *Alactaga indica*, Blanford. Mamm. No. 262.

Sourab, ♀ 2.

Cuvier in 1836 spelt the generic name as above, following Pallas who had already used it specifically. He dropped an "l" in 1838 and was followed by all later authors up to about the end of the century.

(22) ALLACTAGA HOTSONI, Thomas.

*Hotson's Jerboa.*

1919. *Allactaga hotsoni*, Thomas, J. B. N. H. S. XXVI., p. 936.

Kantt, 20 ms., S. W. of Sib, Persian Baluchistan, 3,950 ♀ 1.

(23) TATERA SHERRINI, Wrought.

*The Sind Gerbil.*

1917. *Tatera sherrini*, Wroughton. J. B. N. H. S. XXV., p. 43.

Las Beyla ♂ 1, ♀ 1.

In the Sind Report No. 24, the Gerbil was listed as *indica* later in Results (XXV., p. 43). I distinguished it as *sherrini*. The present specimens appear to be the same species.

(24) *TATERA PERSICA*, Wrought.*The Seistan Gerbil.*1906. *Tatera persica*, Wroughton. A. M. N. H. 7, XVII., p. 496.

Panjgur, ♂ 44, ♀ 39; Hoshab, ♂ 1; Turbat, ♂ 3, ♀ 1; Mand, ♂ 2, ♀ 2; Isiphan, ♀ 1; Daga, ♂ 1; Tuphon Gishai, ♂ 1; Bazdat, ♂ 1; Rekin, ♂ 3, ♀ 4; Manguli, ♀ 1; Seahendamb ♀ 1; Nag, ♂ 1, ♀ 6; Shirejan Palk, ♀ 2; Sitana, ♂ 1; Turbat K'ech, ♂ 5, ♀ 7; Nasirabad, ♀ 1; Sami, ♂ 5, ♀ 1; Tejeban, ♂ 1; Harboi, ♂ 1; Gazar, ♀ 1; Khojdar, ♂ 2, ♀ 2; Chahabar, ♂ 5, ♀ 8.

(25) *CHELIONES HURRIANÆ COLLINUS*, Thos.*The Western Desert Gerbil.*19. *Cheliones hurrianæ collinus*, Thomas, J. B. N. H. S. XXVI., p. 726.

Kelat, ♂ 2; Hazarganji, ♀ 1; Nal, ♂ 1, ♀ 2; Wadh, ♂ 5, ♀ 4; Chahabar, ♀ 4; Chambar, ♂ 2, ♀ 1.

These specimens by their size and the marked slaty bases of the hairs of the belly fall into Thomas's subsp. *collinus*. It is possible that later it may be found that the more western (Chahabar, &c.) individuals (at present the most westerly representatives of the genus) may prove, with Persian specimens, to require a separate name.

(26) *MERIONES PERSICUS BAPTISTÆ*, Thos.*The Persian Jird.*19. *Meriones persicus baptistæ*, Thomas, J. B. N. H. S. XXVI., p. 934.

Charboi, ♀ 1; Kelat, ♂ 4, ♀ 4; Gwambauk, ♂ 1; Koldars, ♂ 1; Pasht Kuh, ♂ 1; Panjgur, ♂ 2; Kulochak, ♂ 1.

I have adopted the English name, based on the local vernacular, given to this genus when its first individual was found in the very early 18th century.

(27) *MERIONES ERYTHROURUS*, Gray.*The Afghan Gerbil.*1842. *Gerbillus erythroura*, Gray. A. M. N. H. X., p. 266.1891. *Gerbillus erythroura*, Blanford. Mamm. No. 267.

Kelat, Baluchistan, ♂ 2; Sourab, ♂ 2.

(28) *DIPODILLUS NANUS*, Blanf.*The Baluch Dipodil.*1875. *Gerbillus nanus*, Blanford. A. M. N. H. 4, XVI., p. 312.1891. *Gerbillus nanus*, Blanford. Mamm. No. 267.

Pasni, ♂ 4, ♀ 2; Gwambauk, ♂ 1, ♀ 1; Har (Kalva), ♂ 1; Rekchak, ♀ 1; Harboi, ♀ 1; Chahabar, ♂ 1; Hoshab, ♂ 2; Shaharak, ♂ 1.

Specimens under this name are recorded in the reports from Kathiawar, Palanpur and Sind. Thomas however after examining the present specimens has arrived at the conclusion that these represent true *D. nanus*, and that the form found in Sind, &c., is distinct, and has published his conclusions elsewhere in this Journal. I have abandoned Blanford's English name which ceases to be descriptive.

(29) *MUS MUSCULUS*, Linn.

*The House Mouse.*

(Synonymy in No. 1.)

Chahabar, ♂ 1, ♀ 1; Pasni, ♂ 1.

Both localities are on the coast and these specimens no doubt represent imported stock. They are not quite the same as European House-mice but until the many shades of change from the Indian frontier westward have been studied as a whole it is most undesirable to multiply named subspecies.

(30) *MUS BACTRIANUS*, Blyth.

*The Kandahar House Mouse.*

(Synonymy in No. 24.)

Panjgur, ♂ 79, ♀ 56; Ispihan, ♂ 2, ♀ 1; Sib, ♀ 2; Mand, ♂ 2, ♀ 1; Chib, ♂ 3, ♀ 1; Turbat, ♂ 3, ♀ 1; Chahabar, ♂ 8, ♀ 7; Johran Kahur, ♂ 1; Khojdar, ♂ 1, ♀ 1; Manguli, ♂ 1, ♀ 4; Sourab, ♂ 4, ♀ 4; Mastung, ♂ 6, ♀ 5; Kalatak, ♂ 1, ♀ 1; Shakarak, ♀ 1.

The most northerly specimens (from Mastung) have been compared with the type of *bactrianus*, Blyth, the type locality of which is Kandahar and I can discover nothing to consistently differentiate these Mastung specimens from the rest. The name has already been used in these reports for specimens from Sind but these are clearly separable on size. Blyth has described a species *gerbillinus* from Pind Dadan Khan which might very well be the Sind species. Unfortunately the Museum has no representative specimens from the Jhelum Valley, or indeed from the Punjab. I propose therefore to use the name *gerbillinus* for the Sind specimens (in substitution for *bactrianus*) until something is known of the Punjab forms.

(31) *ACOMYS DIMIDIATUS*, Rupp.

*The Sinai Spiny Mouse.*

1826. *Mus dimidiatus*, Ruppell. Atlas. p. 37.

Chahabar, ♂ 4, ♀ 1; Karochi Durk, ♀ 1.

These specimens differ from the solitary specimen taken by Waston at Laki near Sohawah. They seem to resemble the Sinai form but it is a difficult group and more material especially of our Sind form is required to make a reliable identification possible. I have temporarily ranked it as *dimidiatus*.

(32) *CALOMYSCUS BALUCHI*, Thos.

*The Baluch Vesper Mouse.*

19. *Calomyscus baluchi*, Thomas. J. B. N. H. S. XXVI., p. 939.

Harboi, ♂ 2, ♀ 5; Kelat, ♂ 5, ♀ 2.

(33) *CALOMYSCUS HOTSONI*, Thos.

*Hotson's Vesper Mouse.*

19. *Calomyscus hotsoni*, Thomas. J. B. N. H. S. XXVI., p. 939.

Gwambauk, ♂ 4, ♀ 3.

The isolated appearance of this genus so closely related to the American genus *Peromyscus*, is most startling. At Mr. Thomas's suggestion I have adopted for it the name *Vesper-Mouse* which is that used for its representative in the U. S. A.



(34) *CRICETULUS MIGRATORIUS*, Pall.

*The Little Grey Hamster.*

1794. *Mus migratorius*, Pallas. Reis, II., p. 703.

1891. *Cricetus phæus*, Blanford. Mamm., No. 309.  
Kelat, ♂ 1.

Thomas has in his paper on this Genus (A. M. N. H. 8, XIX p. 452, 1917) adopted the name *migratorius* as the oldest applying to this species.

(35) *ELLOBIUS FUSCOCAPILLUS*, Blyth.

*The Quetta Vole.*

1841. *Georychus fuscicapillus*, Blyth. J. A. S. B. X., p. 262.

1891. *Ellobius fuscicapillus*, Blanford. Mamm. No. 308.  
Much Baluch, ♂ 2 (juv. I).

(36) *RATTUS RATTUS ALEXANDRINUS*, Geoff.

*The Egyptian Rat.*

(Synonymy in No. 24.)

Chahabar, ♂ 3, ♀ 5; Pasni, ♂ 4, ♀ 6; Talas Sunt, ♀ 1.

These undoubtedly are either imported or from imported stock, elsewhere in Baluchistan, *Rattus* seems to be unrepresented. Four of the above specimens have pure white undersides and possibly represent the *frugivorus* of Rafinesque.

(37) *NESOKIA GRIFFITHI*, Hardw.

*The Hazara Nesokia.*

(Synonymy in No. 15.)

Khojdar, ♂ 1, ♀ 1.

The English name earlier in these Reports does not differentiate the present Genus from *Gunomys*, with the result that some of the other species would require too long a name. I propose to adopt the Latin name *Nesokia* for the Genus.

(38) *NESOKIA INDICA*, Hardw.

*The Rajputana Nesokia.*

(Synonymy in No. 24.)

Panjgur, ♂ 19, ♀ 27.

(39) *ACANTHION LEUCURUS*, Sykes.

*The Indian Porcupine.*

(Synonymy in No. 1.)

Bajukan, ♂ 1; Khojdar, ♂ 1, ♀ 1.

(40) *LEPUS CRASPEDOTIS*, Blanf.

*The Afghan Hare.*

1875. *Lepus craspedotis*, Blanford. Eastern Persia, II., p. 80, pl. VIII.

Pishmant, ♂ 1; Sorab, ♀ 1; Panjgur, ♂ 1, ♀ 1; Sor, ♂ 1;  
Harboi, ♂ 1, ♀ 1; Shah-i-arab, ♀ 1; Hazar Gange, ? 1.

(41) *OCHOTONA RUFESCENS VULTURNA*, Thos.

*The Baluch Pika.*

19. *Ochotona rufescens vulturna*, Thomas. J. B. N. H. S. XXVI., p. 937.  
Harboi, ♂ 2.

As Thomas pointed out in describing this form elsewhere in this Journal the present, for which I propose the name *Baluch Pika*, is a southern form of *O. r. rufescens*, the *Afghan Pika*; there are two corresponding western forms, viz., *O. r. regina* and *O. r. oizier*, completing so far as we know the distribution of the species *rufescens*.

(42) *OVIS VIGNEI CYCLOCEROS*, Hutton.

*The Afghan Urial.*

1840. *Ovis vignei*, Blyth. P. Z. S., p. 70.  
1842. *Ovis cycloceros*, Hutton. Calc. Journ. Nat. Hist., p. 88.  
1913. *Ovis vignei cycloceros*, Lydekker. Cat. U. M. I., p. 88.  
Lashkarankan, ♀ 1; Saplah, ♂ 1; Nali-jingian, ♂ 1; Gwatbuk, ♂ 1; Hoshab, ♀ 1; Gwambuk Kane, ♂ 1; Hodal Pass, ♂ 1; Dab-Koh, ♂ 1; Porigent, ♂ 1.

(43) *CAPRA ÆGAGRUS BLYTHI*, Lyd.

*The Sind Wild Goat.*

1874. *Capra ægagrus blythi*, Hume. Hume P. A. S. B., p. 240. (nomen nudum).  
1898. *Capra ægagrus blythi*, Lydekker. Wild Oxen Sheep and Goats, p. 264 Pasni, ♂ 1; Lob, ♂ 1, ♀ 1; Kilikaur, ♂ 1; Gajar, ♂ 1; Khojdar, ♂ 1 (juv.).

(44) *GAZELLA BENNETTII*, Sykes.

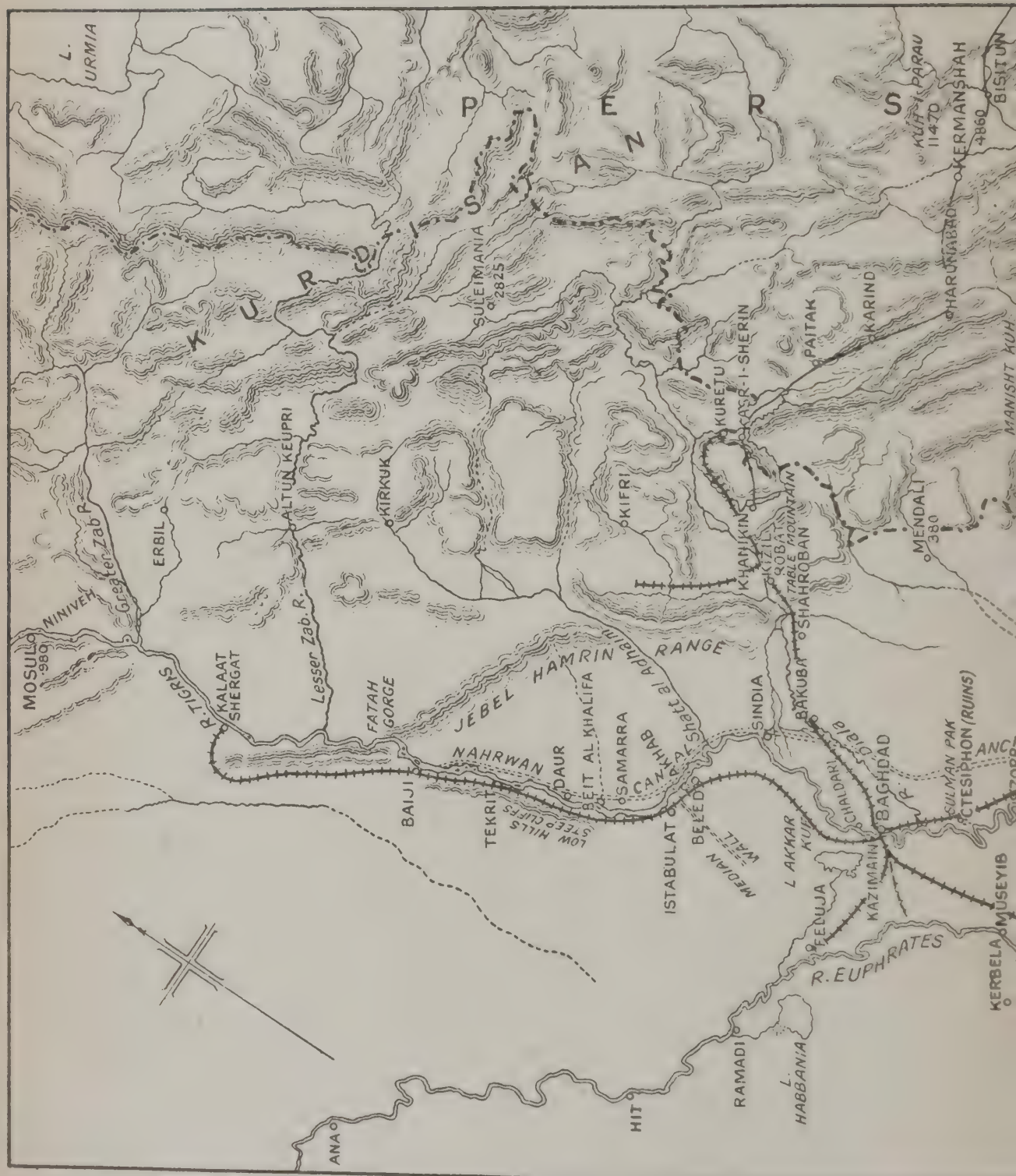
*The Indian Gazelle.*

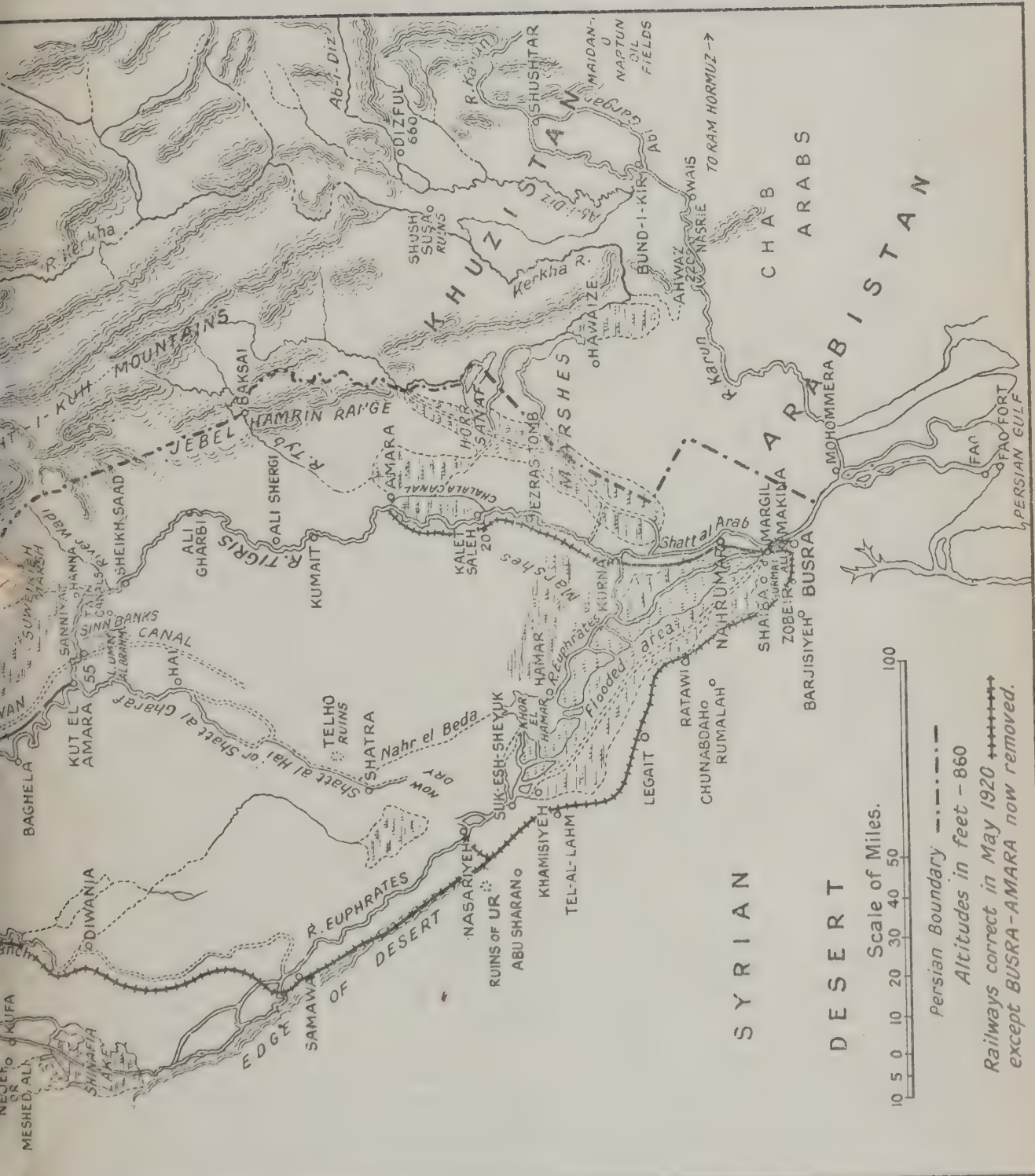
(Synonymy in No. 1.)

- Pasni, ♀ 1; Mand, ♂ 1, ♀ 1; Gumasgi, ♂ 1; Hoshab, ♂ 2; Gajar, ♀ 1; Nasirabad, ♂ 1; Meherab, ♀ 2.
-









SYRIAN

DESERT

Scale of Miles.  
10 5 0 10 20 30 40 50 100

Persian Boundary - - - - -

Altitudes in feet - 860

Railways correct in May 1920 except BUSRA-AMARA now removed.





## REPORT ON THE MAMMALS OF MESOPOTAMIA

COLLECTED BY MEMBERS OF THE MESOPOTAMIAN  
EXPEDITIONARY FORCE, 1915 TO 1919.

BY

MAJOR R. E. CHEESMAN, M.B.O.U., F.R.G.S.

Mr. Oldfield Thomas conferred a privilege when he invited me to write this paper. Both he and Mr. R. C. Wroughton have combined in making the task a light and pleasant one. It has been necessary for me to ply them with a continual hail of questions throughout and to their patient guidance must be attributed any merit the paper may possess. To the rest of the staff in the mammal room of the British Museum Natural History I also acknowledge a debt of gratitude for valuable assistance.

The collection comprises 259 specimens of 36 different species and sub-species. Nine have already proved new to science. Several more are awaiting further material, and are only provisionally placed under the name of their nearest ally.

It may be said, that 'awaiting further material' often recurs in the notes. A lot of confusion is caused by the hasty naming of species and sub-species, on slight differences of colour or proportions, which afterwards prove to be mere individual variation and are not constant. It seems preferable to err on the side of caution.

The collection consists entirely of mammals contributed by members of the Mesopotamian Expeditionary Force. It has therefore an historic interest as well as a scientific value.

Many of the specimens were collected very close to the enemy's lines and some must have been skinned within range of his guns. The acquisition of such a good series under the difficulties attending service conditions is largely due to the encouragement given to all Officers interested in birds, beasts and fishes, by the officials of the Bombay Natural History Society, who in spite of the many calls on their time during the War, always managed to acknowledge and identify the specimens sent.

Again a factor that played no small part, is the able pamphlet, "Notes on the Animals of Mesopotamia", written by Capt. N. B. Kinnear in 1916 and circulated at an opportune moment.

To all interested in Natural History, that is the large majority of Officers and men in Mesopotamia, this has been a treasured book of reference. To those who were collecting it has proved invaluable. I have taken it throughout the writing of this paper as the framework to which the present notes on the specimens obtained must be considered as a supplement.

To Major-Gen. Sir P. Z. Cox, and Lieut.-Col. A. T. Wilson, I was personally indebted while on service for much timely assistance, for the loan of a gun and for facilities of transport of specimens down river and on to India. Without this many of my skins would either never have been collected or have been spoilt or even lost *en route*.

All my specimens have been united under the name of the Cox-Cheesman collection. For the help given me by all my senior officers in Mesopotamia I would like to express my appreciation. They have always been ready to smooth the way for collecting when possible and to read "King's Regulations" in their widest interpretation to that end.

Capt. P. A. Buxton has kindly allowed me to make use of his collection which was sent direct to the British Museum for inclusion in this paper.

The Indian Museum sent a few specimens to the British Museum for identification. These have also been added.

A list of the officers who collected and sent specimens to the Bombay Natural History Society is given below.

Care has been taken to avoid errors, but in the event of omissions or mistakes in the spelling of names it is hoped that they will be excused, as the writing on labels is often difficult to read and is sometimes obliterated.

Major E. Arthur.  
Major R. Bagnall.  
Lieut.-Col. F. M. Bailey, C.I.E.  
Major R. E. Cheesman.  
Major C. Christy.  
F. Collins, Esq.  
Lt.-Col. F. P. Connor, D.S.O., I.M.S.  
Maj-Gen. Sir P. Z. Cox, G.C.I.E., K.C.S.I.  
J. M. S. Culbertson, Esq.  
Deputy Civil Commissioner.  
Lt.-Col. Evans.  
Major F. C. Fraser, I.M.S.  
Capt. Graham, R.A.M.C.  
Capt. R. W. G. Hingston, I.M.S.  
Capt. C. M. Ingoldby, R.A.M.C.  
J. Jenkins, Esq.  
Kilminster, Esq.  
Capt. T. R. Livesey.

Capt. F. Ludlow.  
Capt. H. L. Mackenzie, I.M.S.  
Brig.-Gen. H. J. A. Mackey, C.M.G.,  
M.V.O., D.S.O.  
Lieut.-Col. H. A. F. Magrath.  
H. J. May, Esq.  
Capt. Napier, I.M.S.  
Patiala Lancers. A squadron.  
Capt. C. R. S. Pitman, D.S.O., M.C.  
The late Major G. A. Perreau.  
Major G. B. Scott.  
Capt. G. C. Shortridge.  
The late Capt. W. H. Shakespeare.  
Capt. W. H. O. Short.  
Lt.-Col. F. Wall, C.M.G., I.M.S.  
Lt. D. Webster, R.N.  
H. Whitehead, Esq.  
Lt.-Col. Sir A. T. Wilson, C.S.I.,  
C.M.G., C.I.E., D.S.O.

Although many men are now conversant with the topography of the area covered by this paper, a short sketch will not be out of place, for those who are not. Mesopotamia, for which the Turkish name of Iraq is preferable, is a large flat alluvial plain of comparatively recent origin. It is 450 miles in length and about 150 miles in breadth. The foothills of the Kurdistan and Persian Mountains form a Northern and North-Eastern boundary, while to the South and West lies the margin of the Arabian and Syrian desert.

The land of the lower reaches of the Karun River, although in Persia has been included in this paper, as fantastically it is in the great Mesopotamian plain.

Through the plain the three main rivers—Tigris, Euphrates and Karun—wind a serpentine course towards the sea at Fao on the Persian Gulf. The Tigris and Euphrates unite at Kurna and also at Gurmat Ali to form the Shatt-al-Arab, a river of considerable width. This is in turn joined by the Karun at Mohammerah. All three rivers bring down a large amount of silt, and it is of this the Mesopotamian soil is composed, without any admixture of stones or gravel. The Karun enters the Iraq plain at Ahwaz where it crosses a low spur of the Jebel Hamrin range of hills, in a series of rock-strewn rapids. The Tigris crosses the same range several hundred miles to the North-West through the beautiful Fatah Gorge. It however does not finally leave the land of rocks behind until Samarra is passed, where there are cliffs of conglomerate. This region of undulating hills and rocky ranges extends from Samarra north-west to Mosul as well as along the North and North-East boundary previously mentioned. So far very little collecting has been undertaken there. It is the home of the porcupine and the gazelle grazes on the higher plateau. The latter is also well



distributed along the Mesopotamian plains to the sea. In the immediate neighbourhood of Mosul I have seen the mounds and tunnels of a species of mole or rodent mole which does not occur lower down.

The capture of a 'badger' with young was reported at the Ali Gherbi Military Grass Farm during a flood. From the description there seems little doubt it was the new species of ratel, which has been obtained by Col. A. T. Wilson in the foothills near the Tyb river less than 30 miles distant and is mentioned by Kinnear.

Of real forest land there is none, although the broad belt of date palms that fringe the banks of the Shatt-al-Arab gives that impression from the river, until glimpses of the desert appear a mile or so in the background. These plantations are the haunt of the jackal and the Persian mungoose.

I am inclined to treat the stories of ancient Mesopotamian forests as a myth. If the Kings of Egypt came there to hunt elephants it is probable they also hunted their owners who had imported them. The building of the huge canals at least four thousand years ago points to the land being desert then and not a region capable of sustaining natural forest. Two vast permanent reed covered marshes have been formed above Karna by the overflow of the Tigris, Euphrates and Kerkha, a Persian river. These are the Hammar Lake and Hawaiza marsh. These and smaller marsh districts have so far produced no mammal peculiar to those areas unless we may include the otter. Judging by the number of these skins exposed for sale in the bazaars, they must be plentiful.

Patches of thick jungle occur locally in the large U bends of the rivers and grow a tangle of dwarf tamarisk and Euphrates poplar. They seldom exceed a mile or two in width, but harbour small herds of wild pig. It is unfortunate that no skins or skulls have been sent so we do not yet know the species. We can be sure however that the boars seen are too large to be the Indian pig and I am of opinion that the hair is too brown for the typical European wild boar and lack the hoary grey tinge of the bristles of this species several of which I have examined recently in the London Zoological Gardens. It is also certain from the many mascots seen about the Mesopotamian camps that the young are striped.

Low cover is afforded by scrub growing in the vicinity of banks of rivers and canals. This chiefly consists of a dwarf acacia, *Prosopis stephania*, the "Shok" of the Arabs and the wild liquorice plant, *Glycyrrhiza glabra*; also *Lycium europaeum*, a thorny plant with bright red berries, and *Sueda monoica*, of which the lower leaves are succulent and which appears to thrive also on the salt lands, where no other plants can live.

Here are the wild cat, hares, jackal, mole rats, several of the gerbils (*Tatera*, *Dipodillus* and *Meriones*) and the hedge hogs. The foxes are found in the bare desert country behind, seeming to prefer it to the cover.

The country on the right bank of the Euphrates has distinct features. It is the only real desert region and is in fact the edge of the Syrian desert. Gravel is found as far down as Shaiba within a few miles of the sea. The hyæna, and Loftus' jerboa were obtained in this and no other locality, add to this a very pale fox, jackal and hare and a new hedge-hog and gerbil and we have evidence that this portion of the country contains a fauna of exceptional interest:—

Although the contributors to this collection are to be congratulated on the results, it must not be considered that the work is finished. It has just begun. The satisfaction of the thirst of science can be but temporary. A few notes of the particulars required are given for the assistance of those who find themselves in a position to continue the collection.



The following measurements, if possible in millimeters, should be taken before skinning and recorded on the label:—

1. H. & B. Head and body, that is from the tip of nose to the joint of tail and spine.
2. TL. Tail without end hairs.
3. HF. Hind foot without claws, *i.e.*, from the tip of the longest toe to the hinder side of the heel.
4. Ear. Ear from notch at base to tip. This would be the longest inside measurement of the ear.

In addition it is important to record on the label the date, sex, locality, altitude above sea and your name.

The locality of small villages should be identified with towns or districts well known or marked on maps.

Other field notes such as nature of the soil, food, immature, etc., are also of great assistance when working out a collection.

Have the skin removed as carefully as possible. Correctly made up skins are stuffed and dried, leaving the animal in a squatting position—the front legs pointing forwards, and the hind legs backwards—the bone is pulled out of the tail and a straight wire with wool wound round it takes its place but a roughly made skin is better than no skin at all.

The skull of small mammals at least should be dried with the meat on and sent separately. The bones and teeth travel better when treated thus. Both skin and skull should be labelled with the same number to ensure subsequent identification. The value of a series of skins and skulls of the same species cannot be over-estimated. Accurate identification or separation of closely allied forms, is only made possible by the comparison of a large number of specimens.

Do not hesitate to send everything you can get. It is often the apparently common place which proves to be an important link in the chain.

#### 1. RHINOLOPHUS HIPPOSIDEROS MIDAS, K. And.

1905. *Rhinolophus midas*, K. Andersen, P. Z. S. ii, p. 138.

1918. *Rhinolophus hipposideros midas*, K. Andersen, A. M. N. H. 9, ii. p. 378.

Midas Horse Shoe Bat. Arabic "Kushaf-el-leyl" or "SAHAT".

N.B.—These names apply to all bats in Arabic.

2♂	1♀	Baghdad.	Buxton 23-9-17 to 11-10-17.
1♂	1	"	Ingoldby, Nov. 1917.

A small bat with long pale grey fur, with purplish tinge towards the end of the hairs. The ears are large with curved and pointed tips.

Buxton remarks from Baghdad—Apparently common.

The distribution given is Gilgit to Cyprus. Andersen.

The type locality is Jask, Persian Gulf.

#### 2. ASELLIA TRIDENS, E. Geoff.

1812. *Rhinolophus tridens*, E. Geoffroy, Desc. Egypt. ii., p. 130.

Trident Leaf-nosed Bat.

1. Feluja, Euphrates. Mackenzie. No. date. in al.

2. Lake Akkar Kuf. Baghdad. Pitman, 24-3-17 and 16-8-17 "

This bat is slightly larger than the last, though the description of the fur would be much the same. The very large ears are its chief distinction in the field.

This was compared with the series of *A. tridens* from Egypt and appears inseparable.

Andersen and De Winton give the distribution as Senegal, Algeria, Tunisia, S. Syria and Zanzibar, with a sub-species *A. tridens murraiana* from Karachi and Bushire.

### 3. PIPISTRELLUS KUHLI, Kuhl.

1819. *Vespertilio kuhlii*, Kuhl. Ann. Wett. Ges. Nat. IV., p. 199.

White bordered Pipistrel Bat.

1 ♂	16 ♀	1	Amara	Buxton	29-1-18—7-6-18.
2 ♂			Baghdad	"	8-10-17.
1			Shushter, S. Persia	Bailey.	21-1-18, alt. 500 ft.
2			Busra	Cox-Cheesman	June, 1916.
2			Sheikh Saad	Ingoldby	20-7-16 & 21-7-16.
2			Busra	Christy	June, 1918, in al.

The commonest bat of the lower Tigris.

Although several almost black forms appear in the series, this is usually a small dark brown bat, with short hair and ears and a pale border to the wing filament. Buxton remarks, plentiful in Amara and the only bat that appears in winter on warm nights, and all females were pregnant in March.

Ingoldby saw them chasing insects round the lights of river steamers near Sheikhs Saad, and I found it in numbers in the Busra houses.

Miller gives the distribution as Mediterranean region eastward into Asia. It has been recorded by the B. N. H. S. Mammal Survey from Sind.

### 4. PIPISTRELLUS COXI, Thos.

1919. *Pipistrellus coxi*, Thomas, J. B. N. H. S., Vol. XXVI, No. 3, p. 747.

Cox's Pipistrel Bat.

1. Type.	Beit Mahommad. Amara,	Cox-Cheesman.	20-3-18.
1. Makina,	Busra.	Christy	20-3-18.

A small bat with light grey back, white belly and black ears and muzzle. The type was caught in the house of Sheikh Mahommad, in the vicinity of marshes on the Chahala canal. The Makina specimen in the Mess of No. 33 B. G. Hospital.

It has been named by Mr. Oldfield Thomas after Major-Gen. Sir P. Z. Cox.

### 5. EPTESICUS, Species.

Serotine Bat, spec.

1. Amara.	Cox-Cheesman, 16-3-18.
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A single specimen of a bat was collected in Amara, much resembling *P. kuhlii* in size, but the forearm is longer, colour paler and white border is missing. In the absence of the skull definite determination is not possible until more specimens are forthcoming. It is probably nearly allied to *Eptesicus matschiei pellicens*—several of which were obtained by Woosnam in Ahwaz.

### 6. EPTESICUS HINGSTONI, Thos.

1919. *Eptesicus hingstoni*, Thomas. J. B. N. H. S., Vol. XXVI, No. 3, p. 745.

Hingston's Serotine Bat.

1. Type.	Baghdad.	Hingston, 1-5-17.
1.	Busra.	Cox-Cheesman, 6-8-18.
1. Khazimain,	Baghdad.	" " 8-11-18.
1 ♂.	Busra.	Wall., 15-1-17. M. 16 in al.

Of the two Busra specimens only the skulls have been examined



A bat about twice the size of *P. kuhlii*, fur on the back, mouse coloured, underparts paler, ears brown. It has been named by Mr. Oldfield Thomas after Capt. R. W. G. Hingston.

#### 7. *EPTESICUS WALLI*, Thos.

1919. *Eptesicus walli*, Thomas, J. B. N. H. S., Vol. XXVI, No. 3, p. 746.  
Wall's Serotine Bat.

1 ♀. Type. Busra. Wall, 27-5-16.

The type of this species has a smaller forearm than that of *E. hingstoni*. This bat has been named by Mr. Oldfield Thomas after Lt.-Col. F. Wall.

#### 8. *TAPHOZOUS KACHHENSIS* MAGNUS, Wettst.

1914. *Taphozous magnus*, Wettstein, Ann. Vienna, Nat. History Museum, Vol. 27, page 465.

Babylonian Sheath-tailed Bat.

1 ♂	Amara.	Ingoldby, 29-7-16.
2 ♂	Amara.	Buxton, 27-10-17.
1 ♀	Shaiba	Cox-Cheesman, 1-10-16.
1 ♂ 1 ♀	Ctesiphon Arch	" " 4-10-18.
1	Busra	Connor, 29-6-18. M. 13.

A sub-species of the Kutch Sheath-tailed Bat.

This is a large bat with tail protruding through the centre of the inter-femoral membrane. The fur is confined to the head and central portion of the body, giving a very naked appearance to the limbs and inter-femoral membrane. The ears are large.

They are plentiful in Shaiba and Amara, and after sunset large numbers can be seen emerging from the houses, winging their way with steady flight to the desert. They are also very quarrelsome and noisy in the houses.

The same bat was described under the name of *Taphozous kuchhensis babylonicus* in 1916 by Thomas, who, owing to the war, had no means of knowing that it had been previously described by Wettstein.

#### 9. *PACHYURA*, Species.

Musk rat.

1 ♀	Busra	Cox-Cheesman, 6-8-18.
1 ♀	Busra	Whitehead, 1-6-18.
1 ♂	Kurna	Buxton, 26-3-18.
1	No locality	Connor, Nov. 1918 M. 6 in al.
1	" "	Wall " " M. 5 in al.
1	" "	Wall, no date M. 4 in al.
1	Busra	Wall, no date M. 3 in al.
1	"	Christy, June 1918 in al.

} very large.

There are seven specimens in all of the larger *Pachyura* or musk rats, which seem to represent two forms.

I feel inclined to place together the three made skins and one from Connor in alcohol. This is a gray form and might be indigenous. The other three in alcohol—one from Busra and two without locality are in bad condition—and evidently belong to a larger form. One of these marked M. 3 has the small premolar characteristic of *Pachyura* missing, but whether it has never developed or has fallen out, cannot be positively postulated.



This larger form may well have been imported by shipping, as suggested by Kinnear. The fact that so far all specimens have been obtained on the Shatt-al-Arab, in the area of ports of call of the Indian cargo boats, should not be lost sight of.

It has not been possible to carry the identification further the whole group of these shrews or musk rats, being at present in a state of profound confusion.

*Pachyura* is an oriental genus—but there is one species—a dwarf found in Europe and a few species in East Africa. They have four premolars—one of which is minute. This small tooth is missing entirely in *Crocidura*.

*Crocidura* is an African genus with one or two species in Europe and a few in Asia.

#### 10. *PACHYURA ETRUSCA*, Savi.

1822. *Sorex etrusca*, Savi Nuovo Giornale di Lettere, Pisa i, p. 60.

Pigmy Shrew.

1 ♀	Trenches near Kut.	Magrath, 30-8-16.
1	Busra	Cox-Cheesman.
1	Busra	Fraser, no date.
1 ♂	Amara	Buxton, 5-8-18.

In the present state of our knowledge of these little known animals there seems to be no alternative but to accept provisionally Savi's name *etrusca*.

Kinnear suggests it may prove to be *Sorex pusillus*, whose length he gives as 2.4 inches. Gmelin's original description gives the length as 3.6 inches (German) which is double the size of our largest specimen.

It may be as well to note that our pigmy shrew bears a strong resemblance to some specimens that have recently been sent in from Palestine by Shortridge.

The known range of *P. etrusca* is Spain eastwards to Aden and is now extended to the present locality.

#### 11. *HEMIECHINUS AURITUS*, Pall.

1778. *Erinaceus auritus*, Pallas. Nov. Comm. Acad. Petrop XIV, p. 593.  
Long-eared Hedge-hog. Arabic "gunfudh."

4 ♂ 2 ♀	Amara.	Buxton, 19-10-17, etc.
2 ♂	Busra.	Shortridge, 25-3-16 and 27-3-16.
1 ♀	Busra.	Wall, 17-8-16.
1 ♀	Busra.	Wall, 23-1-17 M. 8 in al.
1	Busra.	Cox-Cheesman, 19-6-16.
	a foot.	Culbertson, 22-1-17.
1 ♀	Amara.	Connor, 9-10-16.
1 ♂	Busra.	Short, 6-5-18.
1 ♀	Busra.	Christy, June 1918—Pregnant. in al.

This is the common hedge-hog of the lower Tigris; specimens are still required from Baghdad and above, also from the Euphrates.

Buxton says, "very common in Amara, hibernates 3 months." He obtained 1 young in July. The writer found it plentiful in Sheikh Saad. This hedge-hog might be described as having hair of whitish brown, almost white in places, with light coloured quills and long ears, the feet and forehead are sandy brown.

The genus *Erinaceus* has now been restricted to the European hedge-hog. The genera *Hemiechinus* and *Paraechinus* being accepted for the more Eastern forms. The difference in the two lies in the front line of quills. In *Hemiechinus* the quills and hair meet in a clear cut line across the

forehead, in *Paraechinus* a groove without quills runs from the centre of the forehead towards the crown. A key and description can be found in Summary of the Indian Mammal Survey, Wroughton, pt. II, J. B. N. H. S., 1918, Vol. XXVI, p. 31.

Trinacris gives the distribution of *H. auritus* as S. E. Europe, Caspian and S. Siberia.

## 12. *PARAECHECHINUS LUDLOWI*, THOS.

1919. *Paraechinus ludlowi*, Thomas, J. B. N. H. S., Vol. XXVI, No. 2, p. 748.

Ludlow's Hedge-hog.

1♂ Type Hit. Euphrates.

Ludlow, 8-8-18.

The type is the only specimen seen. Ludlow remarks that it was on stony desert soil at 400 ft. altitude. He also says that he found this within 20 yards of the Euphrates and that the preceding genus *H. auritus* was plentiful at Hit.

Besides the generic difference, this hedge-hog can be distinguished from *H. auritus* by the colour of the quills which are almost white on the sides of the animal, with a broad row of brown quills running down the centre of the back. Most of the hair is white—the tail, feet and nose being brown—with brown streaks running up the forehead. It also appears to attain a larger size.

Mr. Oldfield Thomas has named this after Capt. F. Ludlow.

## 13. *FELIS CHAUS*, GULD.

1776. *Felis chaus*, Guldénstadt, Nov. Com. Ac. Petrey XX, p. 483  
Jungle Cat. Arabic "Bisoon."

1♀	Amara	Buxton, 2-12-17.
1♀	Qualet Saleh	Webster, Jan. 1911.
1♀	" "	Buxton, 23-2-18.
1	Mesopotamia	Perrian, Jan. 1917.
1♂	Madij	Ludlow, 15-2-18.
1	Shahroban	Mackie, July 1917.
1♀	Shahroban	Indian Museum (Connor), Dec. 1918.

This is the cat frequently met with on the Tigris among the scrub-jungles by the river. It grows to such a size that it is easy to mistake it for the jackal at a short distance. Its black ear tufts, yellow tinge of colouring and short tail have led in many instances to the reports of caracals and even lynxes being seen or shot on the Tigris and Euphrates during the war.

So far the only authentic record of the caracal in this neighbourhood, is the specimen obtained by Loftus at Diefel, which I have examined.

The uniform brick-red colour and absence of black or brown markings would distinguish this caracal at a long distance from *F. chaus*.

These specimens vary considerably. Buxton's from Amara has the under-parts white and is a brightly coloured cat, while his and Webster's from Qualet Saleh, although from much the same locality, are less highly coloured, with buff belly. De Winton dealt with the sub-species of this cat in 1898 (A. M. N. H. 7 ii, p. 291) but I have been unable to determine to which sub-species these belong. Buxton's Amara specimen, skin and skull, can be duplicated from the series of *Felis c. affinis* from India, collected by the Indian Mammal Survey, while the Qualet Saleh skins approximate to the British Museum series of *F. c. affinis* from Egypt and are also very similar to some among the *F. c. affinis* series. Major St. John



compared a specimen obtained near Bushire with a living member of *Felis chaus* in the London Zoological Gardens. He came to the conclusion that they were identical (Blanf. Eastern Persia, ii, p. 36.)

I do not consider the separation of the present series of the Mesopotamian cat from *F. chaus* would be justified as yet.

*F. chaus* is found throughout India, W. Asia and N. Africa. The type locality is the Caspian.

#### 14. *FELIS OCREATA IRAKI*, Subsp. nov.

Pale Eastern Wild Cat.

Type 1, Koweit, Arabia, Shakespeare, May 1913.

1 ♂, Sheik Saad, Tigris, Cox-Cheesman, 8-12-16.

*Felis ocreata* is, according to Temminck, the origin of the domestic cat and is the Abyssinian representative of a group to which these two specimens belong.

It has been known in literature as *Felis caligata*, *Felis maniculata*, and *Felis lybica*. Schwann in 1904 pointed out that the first description of this cat was given by Gmelin, as *Felis ocreata* in 1791.

Besides being widely distributed in Africa, specimens have been obtained near Aden by Col. Yerbury in 1895, at Lahej, S. W. Arabia, by Messrs. Percival and Dodson in 1900, and at Moab, Palestine, by Tristram in 1893. All these Asiatic skins are very similar to the African in shade of colour and markings. The two from Koweit and Sheikh Saad although very similar to each other in these respects, are unlike any of the other specimens in the British Museum and obviously represent a paler race. It has been considered advisable to give them subspecific rank.

#### *FELIS OCREATA IRAKI*, Subsp. nov.

Size similar to Aden and Palestine specimens, with slightly heavier dentition.

General colour dove grey, with tendency to salmon buff shading. Forehead silvery, caused by a subterminal brown ring on the hairs showing past the silvery tip, base of hairs salmon buff. White patch in front of eye. A few buff stripes on the face. Ears uniform reddish buff, a few long reddish hairs at the tips, but no tufts. Back without distinct pattern, colour as on the forehead, darker towards the centre, paler towards the flanks. The buff bases to the hairs showing through on the flanks, form almost invisible spots which lower down become more distinct. Tail long, extending some inches beyond the outstretched hind legs, tip brown black, with two or three brown black rings above separated by greyish white intervals. Belly white, grading to pale buff at the sides and with obscure reddish spots. Legs on the upperside pale creamy white to the toes, thighs and upper fore legs slightly darker with cross bars of pale brown. Underside of the feet brown black.

*Dimensions of the type*.—Head and body, 630 mm; tail, 372; hindfoot, 134; ear, 47. Skull:—Greatest length, 94; condylo basal length, 83; zygomatic breadth, 64.5; palatal length, 34.5; least interorbital breadth, 17; breadth of braincase (broken), 45; upper tooth row behind canine 22.5; length of carnassial, 11.5; greatest length of bullæ, 22.

*Hab.*—N. E. Arabia and Mesopotamia. The type from Koweit, Arabia. Another specimen from Sheikh Saad, R. Tigris.

*Type*.—Apparently a male. B. M. No. 20.1.19.2. Collected May 1913, by the late Capt. W. H. Shakespeare. Presented to the British Museum by the Bombay Natural History Society.



The Sheikh Saad specimen is shorter in the tail than that from Koweit. It was shot in low scrub on the River bank below Sheikh Saad. As this cat appears as a rare straggler within the range of the preceding species, *F. chaus*, with which it might in the field be confused, the chief differences may be emphasized as follows. The tail in typical *F. chaus* reaches little more than half the length of the outstretched hindlegs, in all the *F. ocreata* group the tail extends two to five inches beyond them. The ear of *F. chaus* is deep reddish with a darker patch in the centre and a tuft of long hairs at the tip, in *F. ocreata* the ear is paler, self-coloured, and without the tuft. The hair on the body of *F. ocreata* is distinctly softer. The most marked difference however lies in the skull, which in *F. chaus* is almost twice the size of that of the *F. ocreata* group, with far larger carnassial teeth.

The European wild-cat, *Felis sylvestris*, extends to Asia Minor and will probably be represented in N. Persia, but is not likely to be found on the Mesopotamian plains.

#### 15. HERPESTES PERSICUS, Gray.

1864. *Herpestes persicus*, Gray, P. Z. S., p. 554.

Persian Mongoose. Arabic Jeraydee ma'l Nakhala, or 'Abu al arrais'

1 ♀	Amara	Connor,	25-8-16.
2 ♂	"	Buxton,	21-12-17 & 1-12-17.
1	"	"	25-2-18 1918.
1 ♀	Busra	Shortridge,	12-1-17.
1	Baghdad	Ingoldby	Dec. 17.
1	Busra	Connor,	no date M 22 in al.
1	Busra	Wall	" " M 23
1	"	Christy	June 1918 in al.

This is the common mongoose of the Tigris, at least from Fao to Baghdad. The Arab children tame them easily and sell them as pets for a few annas. Connor remarks that his female from Amara had full grown young following her in August. The first Arabic name, literally, rat of the palm-tree, is misleading, and some men have seriously informed me that they live on dates. But the Arab is not accurate in his observations and seeing a mongoose in a palm tree probably led to this belief.

The type locality is Mohammerah and its range is given from there to Kuzistan. No specimen of a larger mongoose has been so far obtained, but in May 28, 1917, I chased but failed to secure, a large mongoose beyond the oil fields at Maidan-i-Naptun. This might have been an Indian species or even the Egyptian, *M. ichneumon*, which Kinnear points out may reach the country west of the Tigris.

#### 16. HYÆNA HYÆNA, L.

1766. *Canis hyæna*, Linnæus, Syst. Nat. 1., p. 58.

The Striped Hyæna. Arabic Dhab'a.

1 Ur of the Chaldees.

Patiala Lancers.

Lt.-Col. Cox, 1/4 Som. L.I., told me he had seen a hyæna in the desert outside Makina near Busra in 1916, and chased it for some distance on a horse. Ludlow tells me that 4 miles N. of Feluja on the left bank of the Euphrates he rode and chased a hyæna to ground. The earth was in the side of a mound, self dug, with more than one entrance. Outside there was a large larder of Camel and donkey bones.

These, the only records I have of the hyæna are from the Euphrates.

It is probably met with on the Tigris as well, but will nowhere be plentiful. The desert tribes north-west of Baghdad seemed very vague as to its whereabouts or existence there. Sheikh Feisul ibn Saoud from Central Arabia was well acquainted with them and recognised them at once in the London Zoological Gardens.

The specimen from Ur has been compared with a recent series of *Hyæna hyæna* from India, and appears identical with the exception of being slightly paler. The type locality of the species is Bunder Abbas.

The range is Palestine, Persia, Trans-Caspia and India. Also North Africa.

#### 17. CANIS PALLIPES, Sykes.

1831. *Canis pallipes*, Sykes, P. Z. S., p. 101.

Indian Wolf. Arabic 'Dhib.'

1 Shaiba Livesey, June 1917.

1♂ Tanooma, Busra. Christy, May 1918.

In addition to the skins sent, wolves have occasionally been seen and killed on the Tigris, their appearance is however rare and I have not heard of their being seen otherwise than singly or in pairs. The wolf sent by Christy was collected by Major R. W. Cooper, who shot it. He states it measured 26 inches and a bit to the shoulder. It had killed sheep from a wire pen several nights in succession at Tanooma.

On comparison with the series of *Canis lupus* and *Canis pallipes*, there is no doubt that the Mesopotamian wolf belongs to the latter species.

A skin and skull of *C. pallipes* was collected near Aden by Percival and Dodson in 1899 and in 1894 Col. Jayakar obtained a skin of *C. pallipes* from near Bunder Abbas, both are now in the British Museum.

*Distribution.*—Sind and throughout India. The type locality is Dekkan. The occurrence of this wolf in Mesopotamia is a link with those found in Arabia mentioned by Kinnear.

#### 18. CANIS AUREUS, L.

1758. *Canis aureus*, Linnæus, Syst. Nat. 1, 10th ed., p. 40.

Jackal. Arabic Wow-wi.

1♂ Kut Pitman, 13-1-17.

1♂ Shaiba Livesey, Feb 1917.

1♂ Legait „ 5-4-17.

1 Mesopotamia „ 16-10-16.

4 Baghdad Ingoldby, 18-1-18.

1♂ Shahroban Connor, Jan. 1919.

1 „ Indian Museum (Connor), 5-5-19.

2♀ Amara Buxton, 4-11-17 and 17-1-18.

1 Persian Gulf Evans, 14-2-18.

The skins of Mesopotamian jackals are separable into two groups. Some agree with a series selected from the National collection from the direction of Bunder Abbas, the type locality from which Linnæus described *C. aureus*. Unfortunately the type itself is unknown. The skins in this series were from Bunder Abbas. Rae, 1911. Shush, near Dizful, Woosnam 1905—S. Arabia, Bury, 1902. Fao, Cumming, 1893, and Seistan, Kennion, 1910. These with the present collection from the lower Tigris and Euphrates may be described as bearing a ground colour of pale sandy to pale buff. The larger hairs are brown tipped with a few black tipped. The skin sent from Shaiba by Livesey is an exceptionally pale example, but the coat is old and the variation would be caused by the



fading effect of the Shaiba desert sun on an already pale specimen of *C. aureus*. These would therefore all be referable to *C. aureus aureus*. One of Ingoldby's specimens from Baghdad has no duplicates among any of these. The ground colour here is bright fox-red with black tips to the longer hairs in sufficient numbers over the loins to create the appearance of a black patch. This bright colouring is identical with several specimens from Khotz near Trebizond, and one from Greece. Here we have strong evidence of a dark race coming to Mesopotamia from Armenia and meeting the paler *C. aureus* from the Persian Gulf. At Sheikh Saad Garden in 1917 considerable raids were being made by jackals on the fields of melon and vegetable marrow grown for the troops. When the order was given for their destruction the men killed over sixty jackals in a few weeks.

Buxton remarks "abundant everywhere. Destroys broad beans by rolling in them in spring, trampling patches quite flat. Eats cucumbers. Litters of cubs, seen under bushes as soon as they can walk."

#### 19. VULPES PERSICA, Blanf.

1875. *Vulpes persica*, Blanford, A. M. N. H., XVI., p. 310.

Persian Desert Fox. Arabic Huseinee.

- |                       |                      |
|-----------------------|----------------------|
| 1. Legait             | Livesey, 20-4-17.    |
| 4. Purchased at Busra | Shortridge, 26-2-16. |
| 1. Ahwaz              | Ludlow, 4-7-17.      |
| 1. Shatt-al-Adhaim    | Pitman, Nov. 1917.   |

These small foxes are grey on the sides merging into fox-red towards the centre of the back and on the legs and forehead. The throat and underparts contain portions of mauve grey.

Livesey's specimen from Legait is a very pale example with the forehead, flanks and brush almost silvery white, touched here and there with chestnut. The tips of the ears and centre of the neck and back are chestnut brown. This would seem to be a case of partial albinism, as there are cases of similar colouring among a series of *V. leucopus* from Sind.

The long brush becomes white tipped with age.

They are plentiful in the desert mounds formed by the ruins of the irrigation canals of the ancients. In these their earths are found, but they more often lie in the open. Their footmarks can be seen round the holes of Jerboas and Gerbills on which they largely prey. I once approached to within a few feet of one—intent on digging out these small rodents. The Arabs course them with greyhounds and sell the skins in the markets. These skins are often called 'bizoon el chowl' which might be misleading as literally it means 'cat of the desert.'

This fox would appear from the specimens to hand to belong to the *leucopus* group, and there is little doubt it is Blanford's *V. persica*.

*V. leucopus* is found along the Sind, Punjaub frontier, while Blanford gives the habitat of *V. persica* as Persia around Isfahan.

#### 20. MARTES FOINA, Erxl.

1777. *Martes (Mustela) foina*, Erxleben, Syst. Regn. Anim. I, p. 458, Beech Marten.

1. Push-ti-koh. Napier, July 1917.

The Beech Marten keeps to considerable elevations in the mountains and is not likely to be met with in the plains of Mesopotamia, but it contributes to the interest of the paper to include specimens obtained just over the Persian border. Unfortunately there is no skull and the skin has the appearance of a bazaar purchase which would account for the exact locality not being given.



There seems to be little known regarding the Martens in this region although they occur in the highlands of Asia Minor. Major St. John remarks "I am told that Marten skins are commonly sold at Ispahan, said to come from the Westward. But whether this means Asia or the forests of the Zagros I cannot say" (Blanford's Eastern Persia, II, p. 44). The Zagros is an old name for the Push-ti-koh. He assumes that these skins were *Martes abietum*, a synonym of *Martes martes*, the Pine Marten, a species which has a larger amount of white on the throat patch, but reliable identification rests on skull differences.

*Martes foina* has a range from central and southern continental Europe to Western Asia, also Afghanistan and the Himalayas.

## 21. MELLIVORA WILSONI, sp. nov.

Wilson's Ratel.

I ♀ Baksai, Tyb River, Iraq—Persian Frontier. Wilson, May 1914.

The material representing *Mellivora indica* in the British Museum is most meagre. On comparing the present specimen with what is available and with the series from Africa, I find that it shows a number of differences from both, which, though not great in themselves, are so constant that the erection for it of a new species seems justified.

For comparison below I have used a specimen obtained by the Mammal Survey of India from Bengal. The dimensions given in brackets are those of this specimen which unfortunately is a ♀.

### MELLIVORA WILSONI, sp. nov.

A *Mellivora* having the mantle extending almost to the tip of the tail, as in *indica*, but the mantle showing a marked white border along the shoulders and flanks as in so many of the African forms.

Size rather smaller than *indica* (even allowing for the difference in sex of the two specimens compared) with a rather longer tail proportionately.

General colour black with a greyish-white mantle commencing from between the eyes (commencing rather behind the line of the eyes in *indica*) and extending over the entire back and upper side of the tail almost to its tip; bordered by a white band, about 20mm. wide, from the ears along the flanks. The individual hairs of the mantle are pure white to their bases, rather sparse and about 30—35mm. long. Everywhere these overlie a finer, shorter coat of brown hairs (except in the marginal border where they are absent) and these seen through the white hairs give the effect of grey colour to the mantle. On the marginal border the white hairs are closer set, and longer (40—45mm. on flanks), which with the absence of the underfur accounts for the contrast between the margin and the rest of the mantle. The claws are black.

*Dimensions of the type*.—Head and body, 595 mm. (705); tail, 175, (175); hindfoot, 100, (120); ear 19, (19 from dry skin). *Skull*.—Condylbasal length, 122, (133); palatilar length, 56, (55); interorbital breadth, 32, (28); breadth of brain case 58, (62); upper tooth row behind the canine, 27, (28); length of carnassial, 11. 5, (13).

*Hab*.—S. W. Persia, the type from Ram Hormuz, alt. 500.

*Type*.—Adult ♀ B. M. No. 5,10-4-21. Original number 24. Collected 4th April 1905, by Mr. R. B. Woosnam and presented to the National Museum by Col. Bailward.

The specimen taken by Col. A. T. Wilson near Baksai, some distance further N. W. and sent for identification to the British Museum by the Bombay Natural History Society corresponds closely, in all essential characters with the description of *M. wilsoni* so far as the absence of the skull

allows me to judge. The pattern is quite the same. The general black body colour has rusted to a deep brown, except in the centre of the belly, while the pure white hairs on the mantle of the type are altered in this specimen to a creamy white. The claws are cream coloured. Dimensions of the Baksai specimen :—Head and body, 741mm ; tail, 191 ; hindfoot, 102. *Mellivora* from Aden have the mantle darker grey than *M. wilsoni* and the grey of the mantle extending only a short way down the upper surface of the tail, this is more characteristic of the African forms.

The Baksia specimen was caught in open desert, while that from Ram Hormuz was trapped at a hole in a bank among corn lands.

I have named this species in honour of Lieut.-Col. Sir A. T. Wilson. Owing to the absence of the skull it was found necessary to take Col. Bailward's specimen as type of the species.

## 22. LUTRA LUTRA, L.

The Common Otter.

1. Amara. Christy, June 1918. Obtained from an Arab.  
Arabic "Keleb-al-mi"

This proves to be the common otter, *Lutra lutra*, as predicted by Kinnear.

Buxton says :—The marsh Arabs spear them by moonlight with a trident. So far otters have been most in evidence in the marshes in the lower reaches, but there is little doubt that they are found throughout the length of the larger rivers.

Distribution :—Miller gives the range of *Lutra lutra* as N. Africa, eastward into Asia, and westward in Europe to Ireland and north to the Arctic Coast.

## 23. JACULUS LOFTUSI, Blanford.

1875. *Dipus loftusi*, Blandford, A.M.N.H., XVI., p. 312.  
Loftus Jerboa. Arabic Jerboor.

1 ♂ Busra, Cox-Cheesman, 12-10-18.

1 " " 21-10-18 skeleton and skull in al. M. 19.

1 " " 28-10-18 in al. M. 1.

These are the size of a half grown rat.

The kangaroo like legs and thick fur below the feet, of three toes, are the chief characteristics noticed here. Colour of back isabelline, darker towards the tail and white below. The tail is isabelline with a tuft of dark hair ending in a white tip.

These two specimens were kindly given to me alive by Capt. Turner in June 1917 and lived sometime in the collection at Bombay. He obtained them from the line of the Busra-Nasariyeh Railway. During the heat of the day these animals would frequently fight in their cage, make an angry spitting noise like a rabbit when fighting and suddenly fall into a trance like sleep, from which they required a considerable shaking to awaken. They drank frequently, taking small sips in their forepaws. This is remarkable as their earths are often placed where both dew and water would be to all appearances unobtainable.

They usually remove the sand in front of their burrows by pushing it in front of them with their fore feet. For the excavation they adopt the more usual method, i.e., backwards.

The Jerboas are considered eatable by Mahommedan law, the other small rodents are 'haraam' or forbidden.



Blanford gives a plate of this animal in his 'Eastern Persia,' ii., p. 75. In his description in 1875 he mentions that it is distinguished from its allies by its colour and proportion.

*Distribution*.—Persia and Mesopotamia. According to Trouessart Loftus obtained the type at Mohommerah.

24. *TATERA BAILWARDI*, Wroughton.

1906. *Tatera bailwardi*, Wroughton, A. M. N. H., Ser. 7, XVII., p. 498. Bailward's Gerbil. (Bundi Kir, Karun River)

6 ♂	Amara	Buxton, 22-11-17 to 12-10-18.
♂	Sinn Abtar Kut	Shortridge, 6-7-16.
1	Mesopotamia	Bagnall, 12-2-17.
1	Baghdad	Ingoldby, 18-12-17.
3 ♂	Akka Kuf	
	Baghdad	Pitman, 27-7-17.
imm.	"	" 14-8-17.
3 ♂ 1 ♀	Sheikh Saad	Cox-Cheesman, 24-2-17 to 5-3-17.
1 imm.	" "	" 14-3-17.
1	Shahroban.	Indian Museum (Connor), Jan. 1919.

In the Gerbil family the hind foot is long, but the hind legs are considerably shorter than in the Jerboas. This is the most numerous of the Gerbils so far met with on the Tigris at Baghdad and below. It is the size of a rat with large black eyes, soft sandy brown hair, with rufous tinge and speckled with black-brown. Underparts white. The long tail is dark brown above and below and pale at the sides and well covered with hair. This tail marking distinguishes *Tatera* from all other Gerbils.

Buxton remarks that his specimens were taken with cheese and were common among lucerne patches.

Mine were flooded out of burrows made below freshly sown garden peas, on which they were probably feeding.

*Distribution*.—Lower Tigris, Euphrates and Karun rivers.

25. *TATERA PITMANI*, sp. nov.

Pitman's Gerbil.

1 ♀	Type.	Baiji near Fatah Gorge, Tigris, Cox-Cheesman, 18-4-19.
1 ♂	"	" " " " " " " "

A larger species than *T. bailwardi* with less "rufous" on the back and flanks.

The chief distinction is the difference in proportions. The skull of *T. pitmani* being considerably the larger, while the feet of both are about the same size.

Upper surface of back sandy brown, well speckled towards the centre with black brown caused by the brown tips of the hairs. Base of hairs dark grey. A light area around the eye clearly defined, some of the hairs being white to their bases. Under surface white, the lateral line of demarcation not specially sharply defined.

Ears similar to back but darker. Hands and feet white, tail dark brown above and below, pale buff at the sides of the basal half of the tail, terminating in a dark brown tip with elongated hair.

*Dimensions of the type*.—Head and body 194 mm.; tail 184 mm.; hind foot 41 mm.; ear 29 mm.

*Skull*.—Greatest length 49.0 mm.; condylo incisive 45.0; zygomatic breadth 26; nasals 22; interorbital breadth 8; palatine foramina 9.8; upper molar series 7.2.

*Hab*.—The rocky soils and foothills of the Jebel Hamrin range on the N. Eastern boundary of the Iraq plain.



*Type*.—Adult female B. M. No. 19-12-24. 1. Original number 390. Collected by R. E. Cheesman at Baiji, Tigris, April 18, 1919. Another specimen from the same place.

The measurements of the male are:—head and body 203 mm, tail 194 hind foot 41; ear 26. The skull is also larger than that of the type, but was unfortunately incomplete.

The skull measurements are larger than those of the type of *Tatera persica* which is in turn as large or even larger than either *T. toeniura* or *T. indica* according to Wroughton.

This Gerbil will be found to be akin to *Meriones toeniurus* described by Wagner in 1843. The measurements were those of a stuffed specimen without skull, the type locality being given as Syria.

Wroughton when writing on the genus *Tatera* in 1906 (A. and N. M. H. ser. 7 XVII, p. 495) deduced that Wagner's description was too vague to indicate more than a large *Tatera*. Unfortunately there are no specimens from Syria in the National collection.

Of the specimens of *Tatera* obtained by Col. Bailward at Bandi Kin Karun River, Wroughton identified two of the larger with *T. toeniura*. The average measurement in mm. was head and body 187; tail 197; hind foot 42; ear 29. Skull greatest length 47; length of upper molar series 7.

Three smaller specimens from the same collection and one from Loftus from the same locality and one presented by the Euphrates Expedition he describes under the name of *T. bailwardi*. The type, a male, measured head and back, 166 m.m.; tail 182; hind foot 41; ear 28; skull greatest length 44; upper molar series 6.5. Since the arrival of the present series of *Tatera* in the Mesopotamian collection we are able to form the opinion that *Tatera toeniura* does not extend across the desert from Syria to the North-Eastern boundary of Mesopotamia as we now have evidence that in the intervening country on the Lower Tigris and Euphrates the resident species is *T. bailwardi*, to which all *Tatera* obtained at Baghdad and below on the Tigris are referable. It appears safe to assume that the two specimens from Baiji belong to a hitherto undescribed species with a range on the rocky soils above the alluvial Iraq plain.

They inhabit burrows in patches of sandy soil in the vicinity of river banks. I have named this species in honour of Capt. C. R. S. Pitman.

## 26. GERBILLUS CHEESMANI, Thos.

1919. *Gerbillus cheesmani*, Thomas, J. B. N. H. S., Vol. XXVI, No. 3, p. 748.

Cheesman's Gerbil.

1♂. Type Lower Euphrates. Cox-Cheesman, 21-8-17.

This Gerbil was captured on the Busra-Nasariyeh Railway by Capt. Turner, who generously presented it to me. It was taken alive at Bombay. In general colour and size it resembles a brightly coloured dormouse. The edge of the pale chestnut of the back and the white of the underparts meeting in a clearly marked line along the side. The chestnut continues between the ears to a point towards the nose. The hair round the eyes being much lighter.

Mr. Oldfield Thomas has kindly named this after the writer.

## 27. DIPODILLUS DASYURUS, Wagn.

1842. *Dipodillus dasyurus*, Wagner, Arch. Naturg. i., p. 20.  
Dasyurus Naked-soled Gerbil.

1♂ 1♀ Baghdad  
3♂ 1♀ Amara

Buxton, 11 & 12-9-17.  
,, 15-9-18 and 7-11-18.

These are small Gerbils about the size of dormice. The two from Baghdad are pale chestnut on the flanks, shaded to brown towards the centre of the back with underparts white. The tail is darker above than on the side or below. In the four from Amara the general colour of the back is browner than in those from Baghdad.

Buxton remarks from Baghdad "trapped on bare mud banks of the Tigris with bait of flour paste" and from Amara he says "apparently common in bare salt desert with a few bushes of *Suaeda*." *Suaeda monoica* is the common salt loving shrub. He also says "I kept a lot in captivity and they fed almost exclusively on the succulent leaves of this plant.

The burrows are not complicated having 3 or 4 entrances, all within 3 or 4 feet of each other.

The holes descend very steeply to about 12 to 18 inches below ground level.

When you attempt to dig out these animals they scratch their way out of the burrows, into the surrounding earth and definitely block the track they have excavated. If you follow the main burrow you dig past the occupants, which are lying up a few inches away in the soil."

In the present state of our knowledge of this genus it is not safe to go further than provisionally to place these under *D. dasyurus*.

Trouessart gives the distribution of *D. dasyurus* as Arabia, Red Sea and Oman.

## 28. MERIONES CHARON, THOS.

1919. *Meriones charon*, Thomas, A. M. N. H. Ser. 9, Vol. III, p. 269.  
Karun Desert Gerbil.

1 ♂	2 ♀	Kazimain, Baghdad.	Cox-Cheesman, 18-1-19.
1	imm.	Beled, Tigris.	" " 21-10-18. <sup>1</sup>

Another of the Gerbil family: slightly larger than the last.

These were living in earths on the dry banks of irrigation channels among cornland and were trapped with a bait of cocoanut. I have extracted a few sentences from Thomas' description of *M. charon*. "Small, with terminally crested tail, general colour above finely speckled sandy buff, under surface white, tail dull buffy with an upper crest of black hairs."

These have been compared with a series of *Meriones erythrourus* from Shiraz and Kandahar, the reddish colour at the base of the tail is a character of *M. erythrourus* and missing in the Mesopotamian specimens, which also appear to belong to a smaller species.

To *Meriones charon* the resemblance is much closer. This species was found by Loftus on the mounds of Susa, and Woosman obtained the type at Ahwaz, Karun river. As none of the skulls of the Tigris specimens show adult formation, it has been considered advisable for the present to place them provisionally under *M. charon*.

## 29. RATTUS RATTUS, L.

1758. *Mus rattus*; Linnæus, Syst. Nat., 10th ed., p. 61.  
Black Rat. Arabic 'jeraydee.'

N.B.—This name applies to all rats and most small rodents.

2 ♀	Kazimain, Baghdad.	Cox-Cheesman, 30-3-19.
1 ♀	Busra	Kilminster, 17-5-18.
1 ♂	"	Whitehead, 12-5-18.
1 ♂ 1 ♀	Amara	Buxton, 6-11-17 & 27-11-17.
1 ♀	Busra	May, 22-5-18.
1 ♂	Amara	Indian Museum (Connor), Sep. 1916.

The long tail and small size should distinguish this species from the next. This rat is a tree loving species and is frequently seen passing from date tree to date tree by the fronds.

Buxton found it common in houses at Amara.

Hinton has dealt with the *Rattus* group recently in the Journal of the B. N. H. S. of Dec. 20, 1918, No. XVIII. Although many species and sub-species of the house rats have been separated under different names from time to time, in many cases he has been unable to distinguish them specifically.

As instances occur of the black rat being brown and the brown rat being black, I have asked Hinton to identify the *rattus* specimens from Mesopotamia and he has placed them in the two species given—that is *Rattus rattus* and *Rattus norvegicus*.

This rat originally came from India and spread westwards. In Mesopotamia it should be more or less in its original form. It was first taken to England by the Crusaders and also scattered about the world by shipping. Considerable changes of colour and habits have since taken place.

### 30. *RATTUS NORVEGICUS*, Berkenhout.

1769. *Mus norvegicus*, J. Berkenhout, Outlines Nat. Hist. Gt. Britain and Ireland. 1, p. 5.

Brown Rat.

2 ♂	2 ♀	Busra	May, 8-5-18 to 26-5-18.
	1 ♀	"	Whitehead, 4-5-18.
	1 ♂	"	Jenkins, 26-5-18.
	1 ♀	"	No name, 5-5-18.
	1 ♀	"	Collins, 13-5-18.

The large rat with tail shorter than length of head and body.

This rat originated from S. Russia in the region between the Caspian and Lake Baikal. It has spread like *Rattus rattus* by means of shipping, to all parts of the world and likewise dark and light forms have been evolved by change of environment.

It is interesting to note that no specimens were obtained higher than Busra.

### 31. *NESOKIA BUXTONI*, Thos.

1919. *Nesokia buxtoni*, Thomas, J. B. N.H.S., Vol. XXVI, No. 2, p. 422. Buxton's Mole Rat.

1 ♂		Amara	Buxton, 24-4-18.
4 ♂		"	" 31-3-18 to 30-9-18.
3 ♂		Kurna	" 17-5-18 to 17-7-18.
3 ♂		Lake Akkar,	
		Kuf, Baghdad	Pitman, 27-7-17 to 18-8-17.
1		Sheikh Saad,	Ingoldby, 18-3-17.
2 ♂	1 ♀	"	Cox-Cheesman, 26-2-17 to 19-3-17.
	1 ♀	Nasariyeh	Indian Museum (Hodgart) January 1918.

The four skins from Sheikh Saad differ from the rest in the quality of the fur which lacks the inter-mixture of black stiff hairs and the coats are therefore softer in texture.

These mole rats somewhat resemble the English water vole in general appearance.

They may be recognised by the rather short tail, almost hairless, and the enormous length of the rodent teeth. Their hair is soft, golden brown on the back with long black hairs of coarser texture inter-mingled. The under parts are grey white.



Buxton remarks from Amara, they are common but very difficult to trap. He trapped one with cheese, but the rest of his specimens were shot at the mouth of the burrow. He adds: "during the spring floods, they excavate hard even by day light and come to the surface to throw out earth". I also found them difficult to trap and my specimens from Sheikh Saad garden were dug out of their holes by a gang from a Santali Labour Corps, who proved experts at catching them alive in their hands and were sorely disappointed that they were not allowed to eat them.

They live in colonies in holes in dry banks of canals. Their holes are always stopped at the entrance with loose earth. So anxious are they that the holes shall be closed, that I used to remove the loose earth. Very shortly a head would appear and the damage be immediately repaired.

The nearest ally in colour to *N. buxtoni* is *N. huttoni* from Kandahar, an illustration of which appears in Blanf. Eastern Persia ii, p. 61, a neighbouring species.

*Nesokia bailwardi* from S. Caspian is a dark wood brown.

Mr. Oldfield Thomas has named the Mesopotamian species after Capt. P. A. Buxton.

### 32. *MUS MUSCULUS GENTILIS*, Brants.

1827. *Mus gentilis*, Brants, Muizen, p. 126.

House Mouse. Arabic 'Fars.'

8 ♂	5 ♀	Amara	Buxton, 27-11-17 to 8-9-18.
1 ♂		Sinn Abtar, Kut	Shortridge, 5-7-16.
1		Busra	Cox-Cheesman, May 1916.
1 ♂		Twin Canals	" 15-11-16.
1 ♂	1 ♀	Sheikh Saad	Cox-Cheesman, 26-2-17 & 4-3-17.
	1 ♀	Busra	Kilminster, 22-5-18.
1 ♂	1 ♀	"	Whitehead, 15-5-18 & 20-5-18.
2 ♂	1 ♀	"	May, 27-5-18 & 28-5-18.
1		Amara	Wall, M. 10 in al.
1		"	Connor, M. 11 in al.
3		Busra	Christy, June 1918 in al.

These mice are found in the fields as well as in houses, and often turned up in tents in the most distant desert camps. Among the specimens received were several tending to a chestnut brown coloration on the back. The majority were brown.

Blanford obtained a specimen of *Mus bactrianus*, the Kandahar house mouse, from Shiraz and mentions that he expects that this will be the house mouse of S. Persia.

*Mus musculus musculus* of Linnæus, the common house mouse of Europe, although originating from Central Asia, has now been carried all over the world. Typical forms of this have recently been taken at Menjil, N. W. Persia, by Buxton.

*Mus musculus gentilis*, an Eastern form of the common house mouse is found in Egypt. A rough guide to these three forms is belly dark, with slate coloured bases, to hairs, *Mus. m. musculus*. Belly whitish, but with slate bases to hairs, *Mus. m. gentilis*. Belly white, with white bases to hairs, *Mus. bactrianus*. The tails of the Mesopotamian specimens from measurements in the flesh, average 76.5 m.m. which is eleven m.m. shorter than a series recently collected by Hotson in Shiraz. Several Mesopotamian specimens have the pure white underparts of *M. bactrianus*.

## 33. ACANTHION, Species.

Porcupine. Arabic Necce or Da'alej.

1 ♂ 1 ♀. Bait-al, Khalifa, Samarra, Pitman, 1-2-18.

Pitman's two specimens are browner than either *Hystrix cristata* from Europe or *Acanthion leucura*, the common Indian porcupine. One of the Samarra skins had both hind feet white.

The porcupine is sparingly distributed among the rocky undulations and hills, but there is no record of its appearance on the plains. I have seen porcupine quills in the caves of the hills between Samarra and Tekrit on the right bank of the Tigris. On the mounds of Susa near the Kerkha river there was a well used earth of this animal with beaten tracks leading to it.

Blanford originally placed the Persian porcupine with *H. cristata*, but subsequently identified it with *H. leucura*.

The porcupines formerly called *Hystrix* are now divided into two genera. *Acanthion* which includes those from India, and *Hystrix*, comprising the African, as well as the porcupine found locally in the Mediterranean region of Europe.

Muller has lately published a paper S. B. Ges. Nat. Fr., Berlin, 1911, p. 110, describing six new sub-species of the Asiatic porcupines. It is not at present known how many of these will prove valid. As his paper covers the present area I have perforce to leave the species open.

## 34. LEPUS CONNORI, Robinson.

1918. *Lepus dayanus connori*, Robinson, Rec. Ind. Mus. XV, pt. 11, No. 6. Connor's Hare. Arabic "arneb".

7.		Hindiyeh Barrage, Euphrates	Pitman, 2-7-17 to 13-7-17
1 ♂ 1 ♀		Kut	" 13-1-17
1		Shat-al-Adhaim	" 30-9-17
	1 ♀	Jilam plain, N. Samarra	" 4-2-18
	2	Frontier of Arabistan	Wilson
1 ♂		Feluja, Euphrates	Ludlow, 7-1-18
1 ♂		Hit	" 14-4-18
1		No locality	Arthur, 1919.
1 ♂ 2 ♀		Amara	Buxton, 27-1-18 & 11-2-18.
2 ♂		Kumait, Tigris	" 28-2-18.
	1 ♀	Shahroban	Connor, Jan. 1919.
1		Twin canals	Graham, 28-11-16.

The Iraq hare is inseparable from specimens obtained by Woosnam on the Karun river at Bundi Kir.

Robinson in 1918. described a hare obtained between Ahwaz and Mahommerah by Connor. To this it would seem the present species should be referred.

There are two distinct phases of colour in the present series ranging from a ground colour of grey to that of rufus. Even the grey individuals show a tinge of rufus on the flanks, throat and nape of the neck.

I have not been able to discover any constant difference in the skulls, nor do the dates give an explanation that the two phases are due to seasonal change of coat. It must therefore be assumed that these are merely colour variations.

Ludlow's specimen from Hit has features distinct from the rest. It is small with a golden buff ground colour. The tips of the hairs are silvery buff. Black tips and centres to the hairs do not enter into the colour composition of the back as it does in all the rest.

The size may be due to its being a leveret, but there is no skull to decide this.

The arrival of more specimens of this little golden hare from Hit will be awaited with interest.

The examples obtained on the Tigris have been compared with Palestine and Arabian species. All and the Samarra specimen in particular, bear a strong resemblance to a series from the Dead Sea. A series of six *L. craspedotis*, the Beluch hare lately arrived from Plotson in Persian Beluchistan was compared with five Tigris hares from Buxton.

The average head and back measurements taken in m.m. in the flesh were *L. connori* 472 m.m. against *L. craspedotis* 411 mm. Ear measurement *L. connori* 165 m.m. against *L. craspedotis* 123.3 m.m. The Tigris hare is therefore a large bodied, slightly rufus hare with small ears; while *L. craspedotis* is a small bodied grey hare with very long ears.

*Lepus connori* differs from *L. dayanus*, a Sind species in three distinct features. The hair of *L. connori* is long and soft, the upper part of the tail is black and the nape of the neck fox red. *L. dayanus* has short hair of coarser texture. The upper part of the tail is sandy brown and the nape of the neck grey. The comparison of a series of both brings conviction that the Iraq hare is worthy of specific rank and should not be associated with *L. dayanus*. From this it is also geographically separated by a very distinct hare *L. craspedotis* as we have seen.

The range of *L. connori* is at present the lands of the Lower Karun, Tigris and Euphrates rivers.

### 35. GAZELLA MARICA, Thos.

1897. *Gazella marica*, Thomas, A.M.N.H. Ser. 6, Vol. XIX, p. 162.

The Marica Gazelle. Arabic 'gazaal' and 'Dhabi.'

1 ♂	2 ♀	Busra	Dep. Civil Commissioner, 28-3-18 to 16-12-18.
			Died in Victoria Garden, Bombay.
1		Nasariyeh	Livesey, 4-7-17 skin without mask or skull.
1 ♂	1 ♀	Shushtar	Bailey, skulls.
1 ♂		Ahwaz	Ludlow, 3-7-17, skull.
1 imm.		Amara	Buxton, spring, 1918. Skin.

The gazelles have taken more time than any other group of animals in the collection. Partly because the whole position of the Gazelle family, especially in this area, is in need of expert revision. Little reliance can be placed on previous works on the subject as the series on which they are based are small.

Perhaps it will be more helpful in this paper to note briefly the chief features of the geographically neighbouring species with which the Mesopotamian skins have been compared, and the conclusions arrived at.

Any of the species mentioned may occur in Mesopotamia.

The species compared were :—*G. arabica*. *G. subgutturosa* and *G. marica*.

The Arabian gazelle, *G. arabica*. This is a small race, the forehead and nose are bright chestnut. Females horned. Inhabits the deserts of Oman N. of Aden and Western Arabia.

The lower Mesopotamian gazelle lacks the chestnut on the head and has indistinct brown face streaks with a tendency to whiteness increasing with age. It is also larger.

The Persian gazelle, *G. subgutturosa*. These were long coated, with distinctly brown coloration. The forehead was brown, in some specimens white hairs were intermixed.



An extract from a description of *G. subgutturosa* by Lyddeker and Blaine is, males with a goitre like swelling in the throat during the rutting season, color dark sandy faun in summer. In winter much paler. An indistinct dark flank band. Face markings indistinct, the median dark stripe fading into white with age. Females without horns.

It has a range in Persia and Afghanistan, at elevations of 3,000 to 7,000 ft.

The specimens under review differ from these, being shorter in the coat. The color of the Busra skins is sandy with a tendency to pinkish, the legs are almost white, while those of the Persian gazelle are reddish brown and we have a horned female from Major Bailey at Shushter and also from the Deputy Civil Commissioner, Busra.

The description of *G. marica* by the same authors is a pale coloured desert form with white forehead, fawn face streaks nearly obsolete, ears, long-whitish fawn on backs, pale flank bands nearly obsolete. Females with horns.

Range—desert tract from Nejd to W. Oman.

The specimens from lower Mesopotamia include a complete skin, skull and mask of a beautiful adult male from the Deputy Civil Commissioner at Busra. The skin in all particulars, especially in the white nose and forehead, closely resembles the type of *G. marica* in the National collection. The horns of this type are those of a younger animal and are in consequence much smaller. The male skull and horns from Shushter resemble the Busra head. The female from the same locality is that of an adult and is horned. The young male from Ahwaz has horns identical with those of the type of *G. marica*.

The skin from Nasariyeh is much paler than the Busra colouring, but may be young.

These particulars in addition to the resemblance of the Busra skin to this type, have led me to place the lower Mesopotamian gazelle with *G. marica* for the present.

### 36. GAZELLA, Spec.

4♂	2♀	Samarra	Pitman, skulls
2♂	2♀	"	" 13-1-18 masks.
6		Mesopotamia	" 13-3-18 masks.

The heads obtained in Samarra are those of a smaller gazelle than those from lower Mesopotamia. The horns are lyrate in form and of a lighter build. Unfortunately no skins accompanied them. There are two skulls with perfect horns of old males. Two are those of adult females and are without even rudiments of horns. The four masks from Samarra have brown face streaks with a tendency to grizzled white. The six masks marked Mesopotamia, are nearly all white. The whiteness of the heads of gazelles seem on the plains around Tekrit and Samarra and of masks obtained in this neighbourhood and examined by the writer in Mesopotamia has always appeared remarkable. In addition to the neighbouring species previously mentioned under *G. marica* I have compared these with *G. dorcas*, *G. muscatensis*, *G. benneitii* and *G. gazella*.

The Dorcas gazelle, *G. dorcas*, has bright chestnut on forehead and nose, general colour dark-red fawn extending down the legs with a pronounced dark flank band. Female horned. Habitat given in "The Book of the Antelopes." Selater and Thomas as Tripoli, Morrocco through Egypt and Syria.

The Muscat gazelle, *G. muscatensis*, is much the same in size and colouring. Female horned, A resident of Oman Eastern Arabia.

The Indian gazelle, *G. bennettii*—the Chinkara—the horns are short and not lyrate. Female horned. *Habitat*.—From India through Baluchistan and to the shores of the Persian Gulf.

Palestine gazelle. *G. gazella*—bright chestnut on forehead and nose. *Habitat* Syria.

In all these the bright chestnut on the nose and forehead is quite distinct from the facial colouring of the Samarra masks.

The horns of the Samarra gazelle are more delicate than any now in the National collection and I am of opinion that it will prove a new species of which the Females are hornless. In this Mr. Oldfield Thomas agrees. As it will probably be allied to *G. subgutturosa*, the goitre like swelling on the throat of the males during the rutting season, should be looked for and noted. It would also be of value to know if the hornless females from Samarra and the horned females from lower Mesopotamia are constant features.

### 37. OVIS LARISTANICA, Nas.

1909. *Ovis laristanica*, Nasanov, Bull. Ac. Sci. St. Petersb. p. 1179, Laristan Red Sheep.

1 ♂ imm. Baktyari, W. Persia. Scott, June 29, 1911.

1 ♂ imm. no locality. . . . . Arthur. Reed. Bombay, 31-3-19

This material is insufficient for any but provisional conclusions.

The nearest described species of wild sheep are *Ovis orientalis ispahanica*, Nasanov, type locality Ispahan, and *Ovis laristanica*, Nasanov, type locality Laristan, S. Persia.

There are no specimens of either in the National collection. Lydekker in his "Catalogue of Ungulate Mammals," Vol. 1, p. 83, 1913, provisionally allows the Laristan sheep specific rank.

I have had the advantage of seeing an excellent series recently collected by Hotson in Baluchistan and Shiraz, which has been sent to the British Museum for identification, by the Bombay Natural History Society. This, in my opinion, links the Red Sheep of the Push-ti-koh with that of Afghanistan, the type locality of the Afghan Urial, *Ovis vignei cycloceros*, with which the specimens from Baluchistan and Shiraz agree.

The difference between the two groups, *Ovis orientalis* and *Ovis vignei*, are well marked in typical adult specimens. *O. orientalis*, Red Sheep, has hornless females and the curve of the horn of the male if continued from the end points over the shoulder. In *O. vignei*, the Urial, the females have small horns and the horn of the male curves forward, the point being in front of the eye. The subspecies of both are separated chiefly on size, and geographically.

The *Ovis orientalis* group, type locality Cyprus, extends through Asia Minor and Transcaucasia to Persia. A subspecies on the Elburz Mountains has been named *O. o. erskinei*.

The *Ovis vignei* group, type locality Astor near Gilgit, extends through the Salt Range, Punjab, to Afghanistan, where we have the subspecies *O. v. cycloceros* to which the specimen from Baluchistan and Shiraz are at present referred, as they have the typical horn of the *vignei* group and the females are horned.

It seems unlikely that in face of the facts revealed by Hotson's specimens that a subspecies of the group with hornless females should crop up at Ispahan, therefore Nasanov's *Ovis orientalis ispahanica* should be accepted with caution until a confirmatory series of specimens is forthcoming from that locality.

Blanford, in "Eastern Persia", quotes Major St. John:—"I believe, myself, that it will be found that *O. gmelini* is confined to the Elburz and that *O. cycloceros* extends from Baluchistan to Mesopotamia". As *O. gmelini* belongs to the *orientalis* group and *O. cycloceros* to the *vignei* group this quotation seems about to be proved prophetic.

Specimens from Budjurd near the Persian-Turkestan Frontier are of the larger forms of the *vignei* group, and are referred to *O. v. arkar*, a subspecies from the Ust-Urt plateau, Transcaspia.

### 38. CAPRA AEGAGRUS BLYTHI, Lyd.

1898. *Capra aegagrus blythi*, Lydekker. Wild Oxen, Sheep, and Goats, p. 264. Sind Wild Goat.

♀ 1. Shushtar..W. Persia..Bailey, Recd, Bombay, 23-2-18 (skin without skull).

As the only specimen is a female without skull, I have been obliged to assume the probability of the Push-ti-koh wild goats being the same as those recently sent by Hotson from Shiraz, in order to give even an approximate classification.

*Capra aegagrus blythi* is a smaller subspecies than that found in the Caucasus and Asia Minor, viz., *Capra egagrus egagrus*, and has a slighter development or even absence of the knobs on the front edge of the horns and this latter is also sharper in *C. æ. blythi*.

The type locality of *Capra egagrus blythi* is Sind and since the arrival of Hotson's specimens its known range can be extended to Baluchistan and Shiraz.



## A LIST OF SNAKES FROM MESOPOTAMIA.

COLLECTED BY MEMBERS OF THE MESOPOTAMIAN EXPEDITIONARY  
FORCE, 1915 TO 1919.

BY

G. A. BOULENGER, LL.D., D.Sc., F.R.S.

WITH FIELD NOTES BY CAPT. C. M. INGOLDBY.

## TYPHLOPIDÆ.

1. *Typhlops braminus*, Daud.

Basra (Lieut.-Col. F. Wall).

*Habitat*: Southern Asia; Islands of the Indian Ocean; South Africa; Mexico (probably transported by human agency).

## GLAUCONIIDÆ.

2. *Glauconia macrorhynchus*, Jan.

Faleya, Euphrates (Capt. H. T. Mackenzie).

*Habitat*: Algerian Sahara, Nubia, Mesopotamia, Persia.

## BOIDÆ.

3. *Eryx jaculus*, L.

Basra and Sheik Saad (Lt.-Col. F. Wall); Amara (Capt. P. A. Buxton); Shaiba (Lt. T. Livesey); Basra (Capt. C. R. Pitman); Bagdad (Capt. C. M. Ingoldby); Mesopotamia (Maj. Fitzgerald).

*Habitat*: North Africa, S. W. Asia, S. E. Europe.

Very common along the Tigris within a mile or so of the river especially near villages. Excepting *Trop. tessellatus*, the most commonly killed snake owing to his frequent appearance above ground in daylight and his sluggish movements. The largest I have measured was 2 feet 5½ ins. in length.—C.M.I.

## COLUBRIDÆ.

4. *Tropidonotus tessellatus*, Laur.

Basra (Lt.-Col. F. Wall, Lt.-Col. F. P. Connor); Quelat Saleh below Amara, Sheik Saad, Haquicole on Euphrates near Hamar Lake (Capt. C. M. Ingoldby); Faleya (Capt. Mackenzie); Zobeya (Capt. Pitman); Basra (Maj. C. Christy).

Numerous specimens, nearly all with a single upper labial shield (the fourth) entering the eye.

*Habitat*: Europe and Asia as far East as the extreme West of China and the extreme North-West of India, Asia Minor, Transcaucasia, Persia, Mesopotamia, Syria and neighbouring parts of Sinai and Egypt.

Abundant wherever there is water. Major F. E. W. Venning who collected the specimens from the Hamar Lake, on the Euphrates, has told me that on warm days the shallow water edging the lake appears to be writhing with them.—C.M.I.

5. *Zamenis gemonensis*, Laur, var. *asianus*, Boettg.

Basra, Amara, Bagdad, Haquicole (Lt.-Col. F. Wall); Faleya (Capt. Mackenzie); Basra (Maj. C. Christy).

*Habitat*: This form is known from Asia Minor, Rhodes, Cyprus, Syria and Persia.

This exceedingly handsome snake is found almost exclusively in the palm groves edging the rivers. It does not appear to acquire its pure black coloration until over 4 feet in length.

It is a swiftly moving creature, climbing palm trees with ease and biting with accuracy and animus when handled.

I have found lizard remains in the stomach of one; the usual diet however is certainly snakes. Near Bagdad, the only place where I had the opportunity of observing them in any numbers, the victim in the great majority of cases was *Tarbophis iberus*. One specimen kept in captivity for several weeks ate voraciously any small snake offered (usually *Zam. dahlia* or *Zam. ventrimaculatus*) eventually dying as a result of attempting to swallow too large a specimen of the latter. They are thirsty creatures drinking often and copiously from a saucer, occasionally immersing the whole mouth in the process—C. M. I.

6. *Zamenis dahlia*, Fitz.

Bagdad (Capt. Ingoldby).

*Habitat*: S. E. Europe, Asia Minor, Transcaucasia, N.-W. Persia Cyprus, Syria.

This most slender and beautiful snake is common in the palm groves, frequenting the young thorny palm bushes where it can feed in reasonable safety. Its food seems to be chiefly insects, occasionally small lizards.

Active in day-time only. All specimens refused food in captivity—C.M.I.

7. *Zamenis ventrimaculatus*, Gray.

Basra, Twin Canals at Sheik Saada, Esra's Tomb between Quarrah and Amara (Lt.-Col. Wall); Shaiba (Lt. Livesey); Faleya (Capt. Mackenzie); Zobeya (Capt. Pitman); Bagdad (Capt. Ingoldby); Samash (Maj. Lane); Baquba, N.-E. of Bagdad (E. W. E. Wouterz); Sheik Saad (Sir P. Z. Cox), Basra (Maj. C. Christy).

*Habitat*: From the Euphrates to Kashmir and N.-W. India.

An active snake, most frequently met with on the desert at considerable distances from water. The colour harmonises perfectly with the baked earth of its surroundings—C.M.I.

8. *Zamenis diadema*, Schlg.

Basra, Bagdad, Twin Canals at Sheik Saad (Lt.-Col. Wall); Shaiba (Lt. Livesey); Faleya (Capt. Mackenzie); Zobeya (Capt. Pitman); Nasiriyah (Lt. Livesey); Baquba (E. W. E. Wouterz); Daur (Capt. W. M. Logan Home).

*Habitat*: From the Sahara and Arabia to Kashmir and N. W. India.

Very common throughout at any rate lower Mesopotamia. The markings of the young persist in adult life—C.M.I.

9. *Lytorhynchus diadema*, D. and B.

Shaiba (Lt. Livesey); Faleya (Capt. Mackenzie); Awaz (Capt. E. S. Hearn).

*Habitat*: From the Algerian Sahara to Arabia, Syria and Persia.

10. *Contia collaris*, Mén.

Bagdad (Lt.-Col. Wall).

*Habitat*: Caucasus, Mesopotamia, Persia. A specimen from Muscat is preserved in the Collection of the Bombay Natural History Society. I now regard *C. modesta*, Mart. with the scales in 17 rows, as a distinct species.

11. *Contia coronella*, Schlg.

Shaiba, Zobeya (Lt. Livesey); Faleya (Capt. Mackenzie).

*Habitat*: Was known from Syria and S. W. Persia.

12. *Tarbophis iberus*, Eichw.

Bagdad (Capt. Ingoldby); Mesopotamia (Capt. Mackenzie).

The 6 specimens in the collection have the scales in 21 rows, as in Wall's *T. tessellatus* (J. Bomb. N. H. Soc. XVIII, 1908, p. 802) from S. W. Persia, of which I have examined the type and which I cannot separate from *T. iberus*\*

*Habitat*: Caucasus, Mesopotamia, S. W. Persia.

Moves chiefly by night. Usually extremely sluggish and placid, allowing itself to be picked up and handled without protest. One which I had kept in a small box for two days before transfer to a cage was on removal exceedingly aggressive, hissing and biting vigorously. The largest I found was coiled in a bunch of dates, at midday, on the top of a tall palm.—C.M.I.

13. *Cælopeltis monspessulana*, Herm.

Bagdad (Lt.-Col. Wall, Capt. Ingoldby).

*Habitat*: Borders of the Mediterranean, eastwards to the Caucasus and Persia.

Fairly common near Bagdad whenever vegetation is fairly dense.

Lives in holes, usually at the roots of bushes or palms. Most active at night, but not infrequently seen moving in the shade by day, during the great heat. Markings pretty constant, ground colour varying from bluish gray to dark olive brown in specimens of equal size—C.M.I.

14. *Cælope ltiis moilensis*, Reuss.

Sodom, Sheik Saad (Capt. Ingoldby); Shaiba (Lt. Livesey).

*Habitat*: Northern Sahara, from Algeria to Egypt and Nubia, Arabia, Western Persia.

One specimen sent me by Capt. Cheesman from Sodom near Sheikh Saad. The skin between the dorsal scales is orange or bright brick-red colour. On being disturbed the creature dilates its neck somewhat, producing a striking appearance of a vivid flush as if the neck were aglow—C.M.I.

15. *Psammophis schokari*, Forsk.

Basra (Lt.-Col. Wall); Shaiba (Lt. Livesey).

*Habitat*: Borders of the Sahara, Arabia, Syria, Persia, Baluchistan, Afghanistan, Sind.

16. *Naia morgani*, Mocquard.

Shaiba (Lt. Livesey); Mesopotamia (Capt. Mackenzie).

*Habitat*: Previously known from Persia.

When Wall's description of *Atractaspis wilsoni* appeared in this Journal (XVIII, 1908, p. 804, fig.), I concluded that his snake was identical with Mocquard's *Naia morgani* (Bull. Mus. Paris, 1905, p. 78), and I entered it in my notes as a synonym of that species, a conclusion fully confirmed by a comparison with Wall's type specimen kindly entrusted to me by Mr. Kinnear. *Naia morgani* is well characterized by its larger rostral, the internasals separated from the præfrontals, the parietals bordered on the outer side by 3 or 4 temporals, and the entire anal. The Mesopotamian specimens have 23 scales across the neck and 21 across the body. Uniform blackish brown, a little paler beneath.

Wall's *Melanoseps macphersoni* (Journ. Bomb. N. H. Soc. XVII, 1906, p. 27, fig.), from the Aden Hinterland, is a synonym of my *Atractaspis andersonii* (Ann. and Mag. N. H. XVI, 1905, p. 180).

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\* *Typhlops wilsoni*, described as new in the same paper, is, in my opinion, a synonym of *T. vermicularis*, Merr.



VIPERIDÆ.

17. *Vipera lebetina*, L.

Bagdad (Lt.-Col. Wall); Aushuru (Lt.-Col. H. D. Piele).

*Habitat*: Morocco, Algeria, Tunisia, Cyclades, Cyprus, and South Western Asia from Syria and Asia Minor to Baluchistan, Afghanistan and Kashmir.

18. *Cerastes cornutus*, L.

Basra (Lt.-Col. Wall); Shaiba (Lt. Livesey).

All the specimens, six in number, lack the horn-like scale above the eye whence the species derives its name and which is more frequently present than absent in North African individuals.

*Habitat*: Borders of the Sahara, Arabia and Palestine. Had not been previously recorded from Mesopotamia.

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## A LIST OF LIZARDS FROM MESOPOTAMIA.

COLLECTED BY MEMBERS OF THE MESOPOTAMIAN EXPEDITIONARY  
FORCE, 1915 TO 1919.

BY

G. A. BOULENGER, LL.D., D.Sc., F.R.S.

The following is an enumeration of the Lizards sent to the Bombay Natural History Society's Museum during the Mesopotamia Expedition which Mr. Kinnear has entrusted to me for identification. I have also referred to the specimens presented to the British Museum by Capt. P. A. Buxton, Major C. Christy, and Capt. C. L. Boulenger :—

## GECKONIDÆ.

1. *Ceramodactylus doriæ*, Blanf.  
Zobeya, Lower Mesopotamia (Capt. F. C. Fraser).  
*Habitat* : Arabia, Mesopotamia, Persia.
2. *Gymnodactylus scaber*, Rüpp.  
Amara (Capt. P. A. Buxton), Basra (Lt.-Col. F. Wall).  
*Habitat* : Egypt, Arabia, Mesopotamia, Persia, Afghanistan, Sind.
3. *Hemidactylus flaviridis*, Rüpp. (*coctæi*, D. and B.)  
Basra (Lt.-Col. F. Wall, Lt.-Col. F. P. Connor).  
*Habitat* : Coasts of the Red Sea and of the Persian Gulf, Socotra, Mekran Coast, India, Burma.

## EUBLEPHARIDÆ.

4. *Eublepharis macularius*, Blyth.  
Mesopotamia (Capt. H. T. Mackenzie).  
*Habitat* : Mesopotamia, Persia, Transcaucasia, Baluchistan, Punjab, Sind.

## AGAMIDÆ.

5. *Agama persica*, Blanf.  
Euphrates Barrage (Capt. C. R. Pitman), Faleya, Euphrates (Capt. F. W. Mackenzie), Bagdad (Capt. R. W. Hingston), Amara (Lt.-Col. F. P. Connor), Zobeya (Capt. F. C. Fraser).  
*Habitat* : Mesopotamia, Persia.
6. *Agama rudrata*, Oliv.  
Faleya (Capt. H. L. Mackenzie), Amara (Lt.-Col. F. P. Connor), Zobeya (Capt. F. C. Fraser, Lt. T. R. Livesey), Basra (Lt.-Col. F. P. Dickinson, Maj. E. H. Martin).  
*Habitat* : Asia Minor, Syria, Arabia, Mesopotamia, Persia, Sind. Also Egypt and Nubia. *A. pallida*, Reuss, should be regarded as a variety of this species, as some of the specimens from Mesopotamia tend to show.
7. *Agama nupta*, De Fil.  
Mesopotamia (Capt. H. T. Mackenzie).  
*Habitat* : Mesopotamia, Persia, Baluchistan.
8. *Phrynccephalus maculatus*, Anders.  
Zobeya (Capt. F. C. Fraser).  
*Habitat* : Mesopotamia, Persia, Baluchistan, Afghanistan.
9. *Uromastix microlepis*, Blanf.  
Zobeya (Lt. T. R. Livesey), Mesopotamia (Lt.-Col. F. P. Connor).  
*Habitat* : Head of the Persian Gulf.

# VARANIDÆ.

## 10. *Varanus griseus*, Daud.

Nasariyeh (Capt. C. R. Pitman) Mesopotamia (Lt.-Col. F. P. Connor).

*Habitat* : North Africa, South-Western Asia from Arabia and the Caspian Sea to North-Western India.

# AMPHISBÆENIDÆ.

## 21. *Pachycalamus zarudnyi*, Nik.

Shaiba Lezait (Lt. T. R. Livesey).

Originally described from Western Persia, under the name of *Diplometopon zarudnyi*, Nikolsky, Ann. Mus. Zool. St. Petersb. X. 1906, p. 68. A specimen from the Island of Manama, Persian Gulf, was presented to the British Museum by Dr. G. K. Monami in 1910.

# LACERTIDÆ.

## 12. *Acanthodactylus boskianus*, Daud.

Var. *asper*, Aud.

Basra (Maj. C. Christy).

Var. *euphraticus*, Blgr.

Ramadiéh, Euphrates (Capt. C. L. Boulenger).

An interesting new form, described by me in the Annals and Magazine, Nat. Hist. (9) iii. 1919, p. 549.

*Habitat* : North Africa, Arabia, Syria. Had not been recorded from Mesopotamia before.

## 13. *Acanthodactylus scutellatus*, Aud.

Basra (Maj. C. Christy).

*Habitat* : North Africa, Senegambia, Arabia, Syria. First record for Mesopotamia.

## 14. *Acanthodactylus fraseri*, Blgr.

A new species, discovered by Capt. F. C. Fraser at Zobeya and described in this Journal, XXV, 1918, p. 373.

## 15. *Eremias brevirostris*, Bland.

Faleya (Capt. F. W. Mackenzie), Zobeya (Lt. T. R. Livesey), Ramadiéh and Desert of Tel Jebarrah (Capt. C. L. Boulenger).

The types of this species are from Karabagh in the Punjab and Tum Island in the Persian Gulf. The lizard has since been found in Persia near Bushire and in Syria (*E. bernoullii*, Schenkel), and I refer to the same species one of the specimens from Dasht in Baluchistan included by Blandford under his *Mesalina pardalis*.

## 16. *Ophiops elegans*, Men.

Var. *ehrenbergii*, Wieg.

Ramadiéh, Euphrates, (Capt. C. L. Boulenger).

Var. *persicus*, Blgr.

Sharoban, N.-E. of Bagdad (Capt. C. L. Boulenger).

Var. *mizolepis*, Stol.

Euphrates at Suk esh Shuyak and on road from Felujah to Ramadiéh (Capt. C. L. Boulenger).

Amara (Capt. P. A. Buxton), Basra (Lt.-Col. F. Wall).

The range of this lizard extends from Constantinople and Tripoli to N.-W. India. The var. *mizolepis* was originally described from the low country S. W. of Karabagh, on the Indus, and was found at Basra by Blandford; specimens from Haifa in Palestine also appear to be referable to it.



## SCINCIDÆ.

17. *Mabuia vittata*, Oliv.

Amara (Capt. P. A. Buxton), Mesopotamia (Capt. C. R. Pitman).

*Habitat*: Algeria, Tunisia, Lower Egypt, Syria, Cyprus, Asia Minor, Mesopotamia.

18. *Mubuia septemcæniata*, Reuss.

Amara (Lt.-Col. Connor, Capt. P. A. Buxton), Basra (Lt.-Col. F. Wall, Lt.-Col. F. P. Connor), Ramadieh, Euphrates (Capt. C. L. Boulengere).

*Habitat*: Erytrea, Arabia, Syria, Asia Minor, Transcaspia, Mesopotamia, Persia, Sind.

19. *Ablepharus brandti*, Strauch.

Amara (Capt. P. A. Buxton), Basra and Suks-esh-Shuyek, Euphrates (Capt. Boulenger).

*Habitat*: Bokhara, Samarkand, Mesopotamia, Persia, Baluchistan, Punjab, Sind.

20. *Eumeces schneideri*, Daud.

Mesopotamia (Capt. H. T. Mackenzie).

*Habitat*: Tunisia, Egypt, Syria, Cyprus, Asia Minor, Transcaspia, Mesopotamia, Persia, Baluchistan.

## A NOTE ON THE SPECIES OF THE GENUS *MYCALESIS* (*LEPIDOPTERA*), OCCURRING WITHIN INDIAN LIMITS.

(With four Plates.)

BY

LT.-COLONEL W. H. EVANS, R.E.

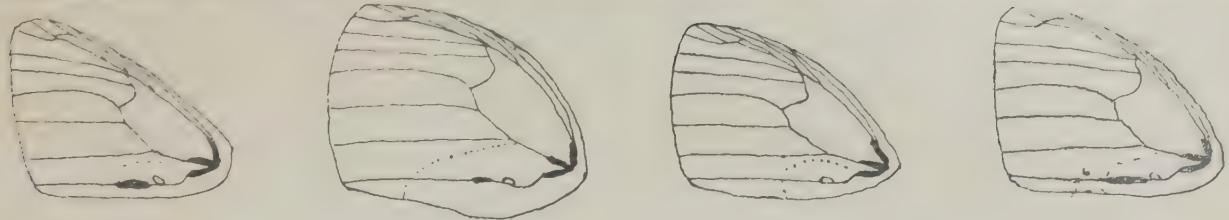
1. Having found it impossible to classify satisfactorily the species of the *Calysisme* and *Samanta* groups of the genus *Mycalesis*, I asked my friends to try and assemble some material for me. Led by the late Messrs. Hannington from Coorg and Ellis from Burma, by General Tytler from Manipur, Mr. Mackwood from Ceylon and followed by several others, my appeal met with a generous response and before the war I had accumulated a very considerable amount of material for investigation. I dissected the genitalia of about 400 males and had prepared the accompanying plates showing venation, primary and secondary sexual characters. Unfortunately the war broke off my investigations and it has been a little difficult to pick up the threads again after an interval of 5½ years.

2. Up to the present the so-called genus *Mycalesis* contains the following "genera" or "sub-genera" and species described from Indian limits; the first named species is the "type" in each case.

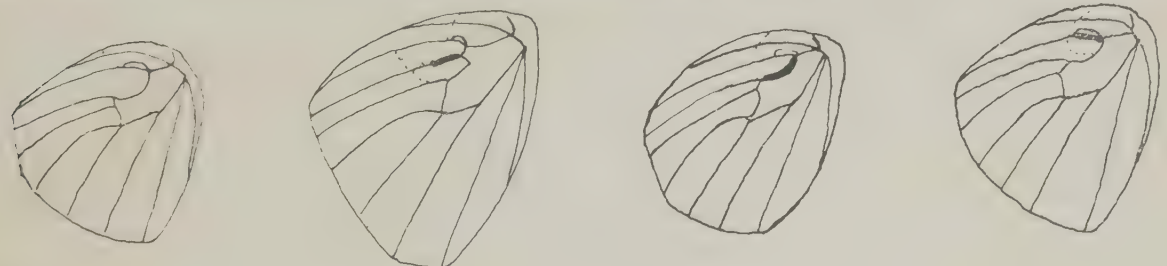
- (1) *Virapa* ; *anaxias* ; *adamsoni*.
- (2) *Samundra* ; *anaxioides*.
- (3) *Gareris* ; *sanatana*.
- (4) *Sadarga* ; *gotama*.
- (5) *Suralaya* ; *orseis*.
- (6) *Mydosama* ; *fuscum*.
- (7) *Calysisme* ; *mineus* ; *perseus* ; *perseoides* ; *subdita* ; *visala* ; *rama* ; *evansii*.
- (8) *Myrtilus* ; *mystes*.
- (9) *Tekinga* ; *adolphei* ; *oculus*.
- (10) *Culapa* ; *mnasicles*.
- (11) *Pachama* ; *mestra* ; *suavolens*.
- (12) *Samanta* ; *malsara* ; *watsoni* ; *nicotia* ; *misenus* ; *heri*.
- (13) *Kabanda* ; *malsarida*.
- (14) *Nissanga* ; *patnia*.
- (15) *Loesa* ; *oroatis*.

Except that the 3 last named species under *Samanta* appertain rather to *Pachama*, the above groups, which are based on the venation and the secondary sexual characters, form a very natural arrangement. I think, however, that the employment of subgenera is now generally considered undesirable. For the purpose of classifying the species in the genus, the first step needed is a careful analysis of all the features at all stages; the next step is the arrangement of the species in as natural an order as is possible; the final step is the production of a key, whereby the species fall into certain groups, which can be designated by letters, numbers or Latin or English names. We all realise that any linear arrangement is bound to be unsatisfactory, as it is opposed to the whole system of evolution, but it is the only thing to be done. I consider that all the species mentioned above should be included under one genus, which may be called *Mycalesis* for the present, though eventually this name will have to be restricted to the African species with naked eyes and *culapa* used for the hairy-eyed Asiatic species. The genus *Orsotriana* has sometimes been included under *Mycalesis*, but its smooth eyes, venation, primary and secondary sexual characters, as well as its facies, entitled it to full generic rank, which Bingham very rightly accorded it.

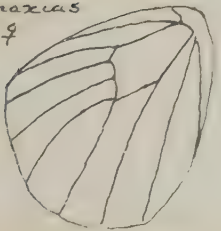
3. The results of my investigations are embodied in the key at the end, where the outstanding features of each species and race are summarised. Most of these



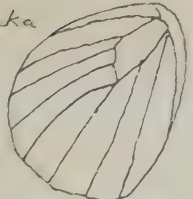
(V. rufus) *anaxias*, ♂. (Samundra) *anaxoides*, ♂. (Sadarga) *charaka* ♀. (Gorevis) *sanatana*, ♂.



*anaxias*  
♀

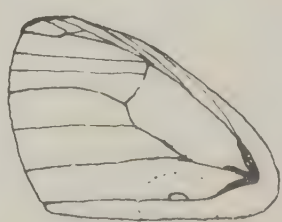
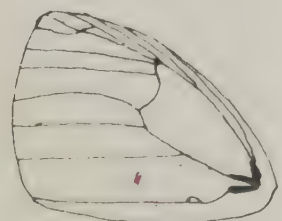
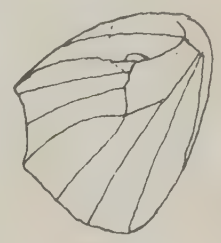
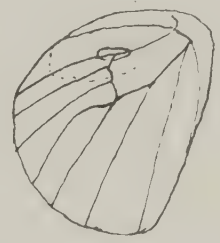
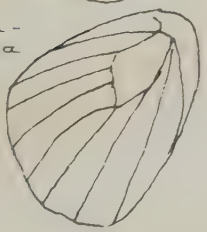


*charaka*  
♀

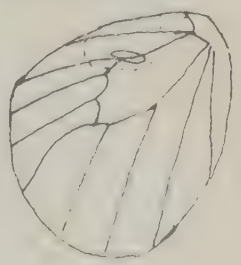
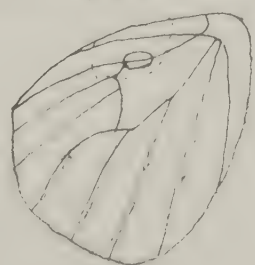
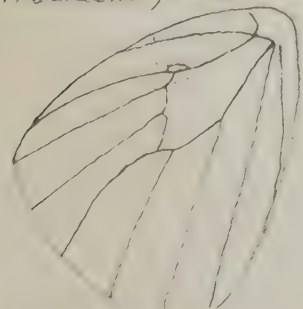


(Suralaya) *orseeis*, ♂. (Calysime) *khasia*, ♂. (Telinga) *oculus*, ♂.

*sanatana*  
♀



(Pochama) *mestvo*, ♂. (Pachame) *suavolens*, ♂. (Samanta) *nicotia*, ♂. (Samanta) *misenus*, ♂.







features have been dealt with by other authors and the only point that I wish to draw attention to is the correlation between certain of the secondary sexual characters.

A—Forewing below a nacreous patch of variable size above the dorsum, usually containing an oval cavity lying along vein 1 filled with androconia; this feature is correlated with an almost exactly similar one on the upperside of the hindwing, situated above vein 7 at its origin; over the androconial patch on the hindwing there is an erectile tuft of fine, long, hairs springing from within the cell. The actual androconial patches or brands may be missing in certain species, but the nacreous areas on both wings and the hair pencil on the hindwing are present in all species of the genus.

B—Forewing above an elongated cavity along the middle of vein 1 filled with androconia and covered by a hair pencil springing from nearer the base; this pencil is moveable in the plane of the wing, but is not erectile; it is usually tucked into a narrow slit along the centre of the androconial patch; on the underside of the forewing the patch appears as a raised lump. Correlated with this feature are certain distortions and swellings of the veins of the hindwing. This character is present in a greater or less extent in Moore's genera *Virapa*, *Samundra*, *Gareris*, *Sadarga* and *Suralaya*.

C—A few species have developed additional features, which are referred to in the key.

4. The *Calysisme* group is dealt with in the next paragraph; the following notes deal with the remaining groups:—

(a) *anaxias* was described by Hewitson from South India. Fruhstorfer gives *æmate* as the race from Burma, stating that it differs from the Sikkim form in being larger, having the outer margins broadly paler and in that the pre-apical band is yellow rather than white; I have only one male of *anaxias* from Burma (Tavoy), which has the band slightly yellower and wider, but a more extensive material might perhaps justify the name *æmate*. South Indian specimens differ, however, constantly from specimens from N. E. India in that the brand on the upperside of the hindwing is black instead of white; above the white band is broader in the male, while below this band is sharply defined outwardly by an apical brown area and not diffused into a pale yellow apical area, as is the case with the Northern dry season form. I therefore propose the name *miranda* for the *anaxias* race flying from Sikkim to Manipur. I have no specimens of an *anaxias* form from the Nicobars, but I would like to point out that the descriptions given by Doherty and Bingham of *manii* differ so greatly that they hardly seem to refer to the same insect.

(b) *sanatana* is considered by Fruhstorfer to be a race of the Chinese *francisca*. Specimens from S. Burma have the hindwing prolonged and are paler; they are probably what Fruhstorfer calls *gomia*, but his description and locality for this race are very obscure. I consider Tytler's *albofasciata* to be a high elevation race of *sanatana*; it is closely allied to Leech's *magna* from S. China.

(c) *nudgara* is given by Fruhstorfer as the Tenasserim race of *nicotia*; I have no specimens to enable me to confirm the differences he mentions.

(d) The *malsara* group has been cleared up by General Tytler in B. N. H. S. XXIII, 226, but I think that my *watsoni* should be sunk to Cramer's *mamerta*, if Fruhstorfer's figure in the Macro-Lepidoptera is correct. In Tenasserim, as seems to occur with other species of this genus, the forewing is prolonged at the apex and the hindwing at the tornus, while the outer margin is scalloped; the shape agrees with what Fruhstorfer calls *annamitica* but the secondary sexual characters are not so highly developed; it might stand as *annamitica* for the present.

(e) *perna*, *sarkha* and *nautivus* are considered to be the Indian races of the Malayan *mnasicles*, *oroatis* and *orseis*; *charaka* is a race of the Chinese *gotamu*.

5. In the *Calysime* group *rama* and *evansii* are easily separated, but the remainder afford one of the most difficult problems in the study of butterflies; males may be dealt with more or less satisfactorily, but the females in some cases are almost impossible to separate. An additional complication is that in S. India several species fly in 3 forms—normal dry season, normal wet season, and an intermediate form, with complete, but reduced ocelli. I started off by dissecting the genitalia of nearly 300 males and then, taking into account the various features and localities, arranged them over labels bearing the names given in the key.

(a) *perseus* occurs throughout the area and I have no difficulty in separating this species in either sex. The Southern form differs as detailed in the key.

(b) *mineus* also occurs throughout the area and the Southern race always runs smaller; the intermediate form occurs in this species in North India as well as in South India. The diffused ring of the ocellus seems to separate this species fairly satisfactorily from everything except *igilia*, but here the angulation of the discal band on the forewing below serves to distinguish the latter species.

(c) *igilia* is what Bingham described as a variety of *perseoides* from Kathlekan, Mysore, and on the strength of this description Fruhstorfer gave it the name *igilia*, placing it as a race of *perseoides*. I have a long series from Coorg and a specimen from Travancore. It has nothing to do with the Burmese *perseoides* and is a very well defined species with a very restricted locality. It flies with *orcha* but not apparently with *subdita*.

(d) *mercea* is an isolated species flying in Pachmarhi with *visala*, from which it is easily separated by its smaller size and the tessellated border of the hindwing. I found it common in October 1910, just when the dry season brood was out in full swing and a few individuals of the wet season form were still about; curiously enough all the fresh males were of the intermediate form and all the females normal dry season.

(e) *perseoides* is an isolated species from Burma and is common in the neighbourhood of Rangoon. It is easily recognised in the male, while the peculiar, dull ochreous tint on the underside of the dry season form is very characteristic, being found also in *mystes*.

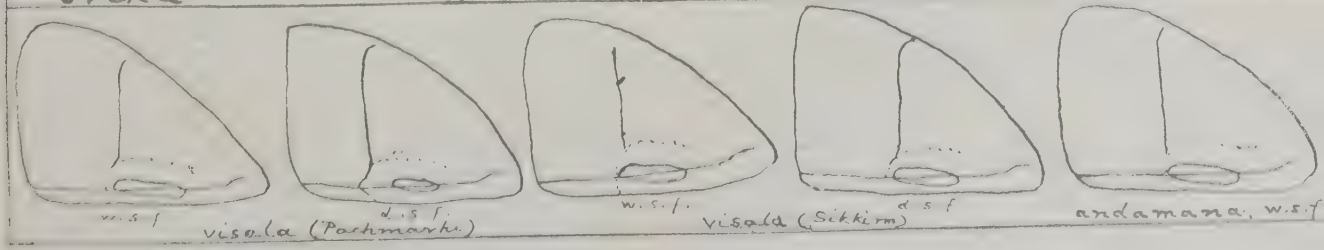
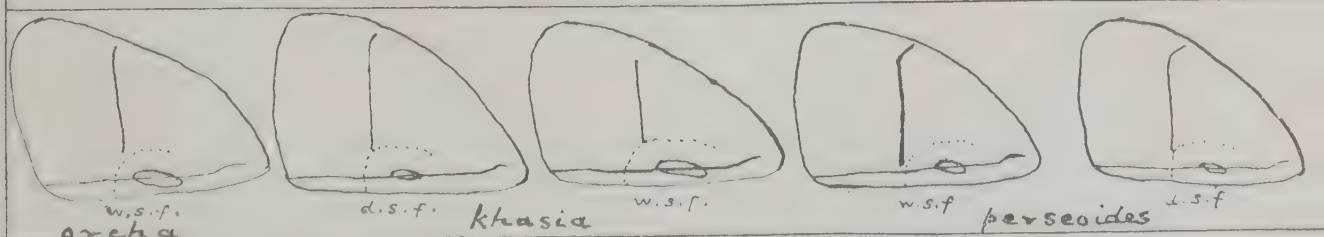
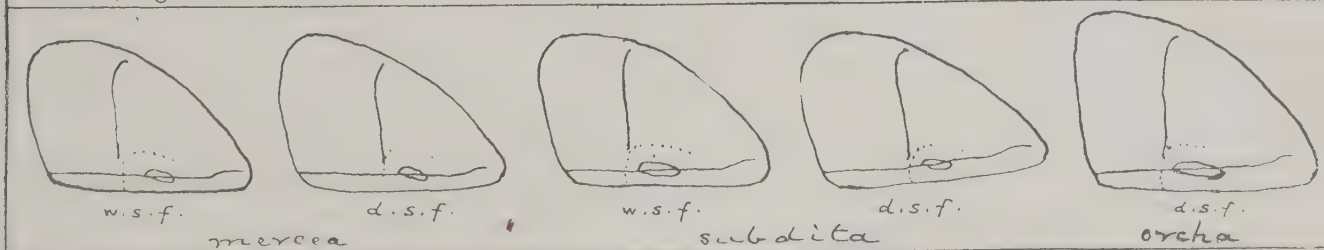
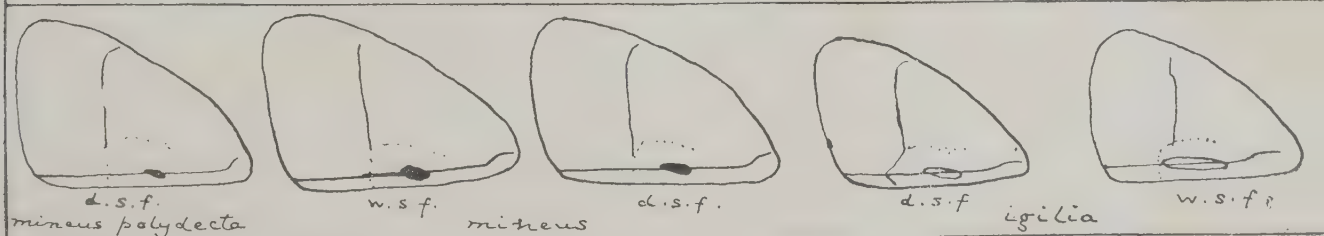
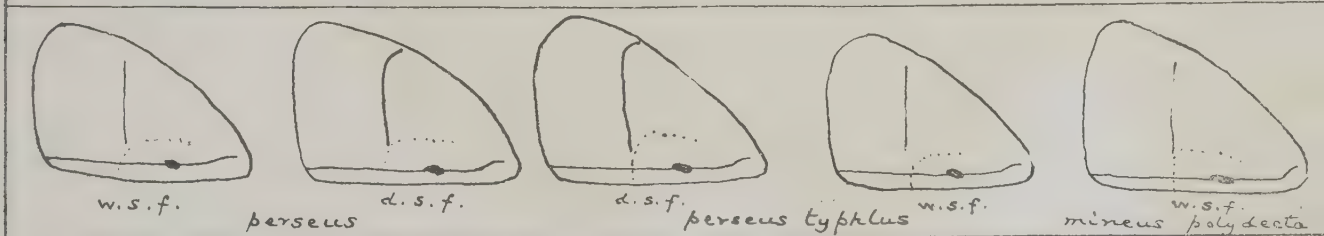
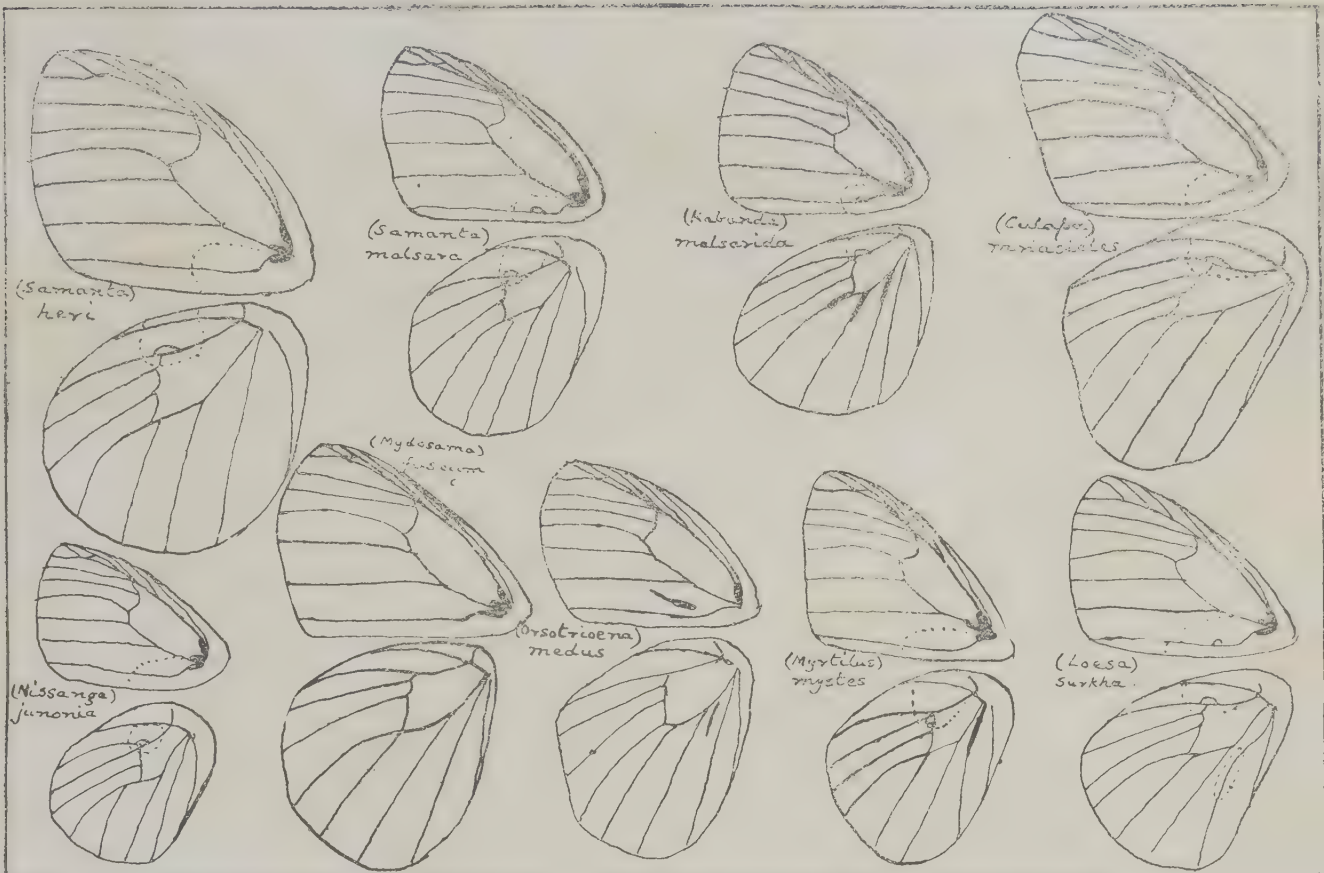
(f) *visala*—I have from Pachmarhi, Sikkim to Burma and the Andamans. It is a well defined species as regards the secondary sexual characters of the male and the pointed forewing of the dry season female; wet season females are very difficult to separate from *hasia*. I do not think that it occurs south of Pachmarhi, specimens recorded from South India being either *subdita* or *orcha*. Fruhstorfer makes a point of the venation of *visala* differing from that of its allies, but I cannot find any appreciable constant difference, though individuals differ to a certain extent. The Pachmarhi dry season form differs from N. Indian forms in having the band on the underside of the forewing a good deal shorter, while the discal line on the forewing above is very prominent. It is rare east of Sikkim, where its place appears to be taken by *hasia*. From Burma I have very few specimens, but Fruhstorfer's name *neovisala* seems justifiable.

(g) *subdita*—I have from Ceylon, where it is the only form of this group and from a few localities in South India, where it seems very rare. The differences between it and *orcha* are given in the key; they are not very considerable and but for the differences in the male genitalia, I should not have separated them. Had *subdita* been confined to Ceylon, I would have treated it as a race of *orcha*.

(h) *hasia* and *orcha* are very alike and, but for the fact that *orcha* occurs in an intermediate form, I would not have separated them as races.

6. Several authors have hinted that the various species of *Mycalesis* interbreed. I do not agree; races no doubt do, where they meet, but to me the essential definition of a species is that it does not interbreed with another species.







is probably impossible to evolve any theory to account for the development of the very closely allied species of the *Calysisme* group, but something on the following lines may have taken place. *perseus* and *mineus* I take to be the oldest, the former having remained pretty constant and not developed into other species. *mineus* is an insect of the plains and in the dim distant past it developed into 2 races (a) and (b) whose areas became cut off but again became re-united after sufficient time had elapsed to establish the races as species. *mineus* (a) preferred the plains, while *mineus* (b) preferred the hills, where, as these elevations became elevated and separated from one another, it developed into a number of local races, say  $b^1$  to  $b^n$ . Eventually changes in the earth's crust, temperature, etc., permitted these races to extend into one another's area; some no doubt re-united, while others led a separate existence, entitling them to be ranked as species. *mineus*  $b^1$  = *subdita* developed in Ceylon, whence it has spread to the continent, where it refuses to interbreed with its cousins, but finds it difficult to maintain its existence in face of the competition prevailing. *mineus*  $b^2$  = *igilia*,  $b^3$  = *mercea* and  $b^4$  = *perseoides* have not spread into other areas, but refuse to interbreed with their invading relations. *mineus*  $b^5$  = *visala* developed in Sikkim and has successively invaded the Central Provinces, but its penetration eastwards has not met with the same success. *mineus*  $b^6$  = *khasia* developed perhaps in Assam, whence it has very successfully invaded S. India and Burma. It is the most abundant species as far as my experience goes.

7. Regarding the plates: they have been drawn by myself and are, I am afraid, very crude. The intention of the plates showing venation is only to illustrate the features mentioned in the key; no other conclusions should be drawn from them. A study of the plates depicting the genitalia will, I think, be worthwhile; they bear out to a certain extent Moore's subgenera and the arrangement adopted in my key. Where more than one example for a species has been taken, it must not always be assumed that the genitalia differ with the locality, as may seem to be indicated by the drawings; I have tried to represent, as far as possible, the variations that occur in the species; in some instances, however, there is no doubt that the locality does affect the genitalia very considerably. In some species, e.g., *nicotia*, the clasps vary very considerably with individuals, but the tegumen and the hooks are pretty constant. The difference in the hooks between the closely allied *malsara* and *lepcha* is very noticeable. *belhami* and *davisonii* have clasps more related to *memerta* than to *lepcha*, whose genitalia differ greatly with the locality, but their facies lead me to regard them as races of *lepcha*. The teeth at the upper edge of the clasp are much finer in *malsara* than in *lepcha*. The clasp of *mnasicles* and the hooks of *patnia* are very extraordinary. It will be seen that the *Calysisme* group is a very definite one and, as one might imagine from their facies, the clasps resemble one another very closely, except that *evansii* is very distinct. *igilia* and *mineus* are allied to one another and well distinguished from the rest. *subdita* from its clasp is easily distinguished from the otherwise almost inseparable *orcha*. The clasp of *perseoides* is variable and approaches that of *visala*, it is curious how very different the clasp of *mystes* is to any member of the *Calysisme* group though females are quite difficult to separate.

8. The following abbreviations have been used in the key:—

A, B, C refer to the secondary sexual characters, see para 3.

V refers to the venation.  $v^1$  = vein No. 1.

f = forewing and h = hindwing.

upf, unf, uph, unh, = upper and underside of the forewing and hindwing respectively.

DSF & WSF = dry and wet season forms.

dcv = discocellular vein.

The figures given after the localities represent the average expanse in inches and decimals of an inch of males and females respectively.



Key to the Indian *Myrmica*.

1. (10). R—present. V—origin 10 f at or near end cell.  
2. (11). F—above unmarked, dark brown; below outer area pale, median in W.S.F. black and yellow in D.S.F. A—f no band, h broad white, rest pale yellow. B—f broad black, prominent both sides; rest black. G—f dark brown, from outer side of v; h origin v' pushed back as before. middle of cell reaching upper div very long and convex. C—absent. V—h 2 h 4 from end cell; g h 7 well separated in 2.

*minima*, Wal. Manipur—N. Burma. 1.5—2.0.

3. (12). F—above pre-apical white band.

4. (13). C—absent. V—as 2.

5. F—inner edge apical band midway between apex and end cell.

a'. F—above no prominent cell; below as 2. A—f broad small, black; h rest pale yellow. B—as 2.

a. A—h broad black.

*minima*, How. S. India. 1.4—2.1.

b. A—h broad pale yellow.

a'. as 4).

*minima*, How. S. India. 1.5—2.0.

b'. F—above pale narrow, apical band yellowish.

*minima*, How. S. India. 1.5—2.0.

6. F—up prominent cell in 2 sometimes also in 3 and in 2 up. Below uniform brown; h broad band obscure in 2, irregular and white in 3. A—as 2. B—f broad and rest very obscure; h median as 2.

*minima*, M. Andaman. 1.5—2.0.

7. F—apical band broader, inner edge extends nearly to cell.

*minima*, How. S. India.

8. (14). C—f obscure pale patch between bases 3 & 4; h prominent black cell between bases 3 & 7; cross h very arched. A—as 6a'. B—f broad and h brown and only above v; h v' pushed back as well as 7 and basal half of 8 cell. V—h' h 4 from end cell; g h 2 from a point in the 2. F—up cell in 2 more or less apparent; below as 2.

*minima*, M. S. Burma. 2.2—2.5.

9. (15). F—above brown, pointed cell in 2 at least; and more as cell in 3. A—f broad small, brown; h broad and rest brown. C—absent.

10. (16). V—h v' from end cell. B—as 2.

a. F—below dorsal band line; up mostly cell in 3, some up.

a'. as 10.

*minima*, M. S. Burma (below 4,000 ft.). 2.4—2.2.

b. F—pale, h prolonged.

*minima*, M. S. Burma. 2.4—2.2.

11. F—below dorsal band white; up prominent cell in 2, and sometimes in 3 & 3 up.

*minima*, M. S. Burma (above 4,000 ft.). 2.1—2.2.

12. (17). V—h 2 from before end cell. B—f no band, rest very obscure; h upper div as a 2, but swollen. F—pale brown; up cell in 2 large and prominent, also one in 3, up no cell; below pale brown, mainly darker in D.S.F. dorsal band white.

*minima*, M. S. Burma. 1.5—2.0.

13. (18). F—f above purple glossed, no pointed cell; g pale brown, all cell show through and are pointed obscurely; below pale reddish, dorsal line dark brown. A—f broad brown, median size; h broad long, brown; rest dark brown. B—f rest brown, obscure and no band; h origin v' pushed back, but div is straight. C—f dorsal very convex; h large black patch between bases 2—4.

*minima*, How. S. India. 1.4—2.1.







10. (1). B—absent.
11. (52). V—origin 10 at or near end cell, f.
12. (33.51). V—origin 3 h at or just beyond end cell.
13. (14). V—f dev between 4 & 5 nearly straight. F—♂ above dark brown, ocelli show through unpupilled; ♀ pale brown, all ocelli show through complete with pupils and rings. Below ochreous, with 2 prominent fulvous bands. A—f no brand; h no brand, only a cavity; tuft white. C—h  $v^6$  swollen at the base.
- fuscum*, Fd., S. Burma. 1.7—2.0.
14. (13). V—f dev between 4 and 5 concave and angled.
15. (30). F—above normally only an ocellus in 2f (except 18.a) very rarely an ocellus in 5 f or 2 h (usually so in 28), but never more than one ocellus h.
16. (29). V—h 6 and 7 well separated at the base; lower dev at an angle to  $v^3$ . C—absent. A—tuft pale yellow.
17. (20.27.28). A—f small brand placed centrally under the origin of  $v^2$ .
18. (19). A—h brand black; f black; very small. F—ocellus upf never ringed; unh ocellus in 3 shifted prominently out of line towards termen; unf WSF curved series of ocelli in 2, 3, 4 and 5; DSF termen f straight or slightly concave.
- a. F—above usually unmarked in WSF. Smaller.
- perseus typhlus*, Fr., Ceylon—Himalayas and Bengal. 1.6—1.9.
- b. F—above always with a pupilled ocellus in 2 f. Larger.
- perseus perseus*, F., Kangra—Burma. 1.7—2.0.
19. (18). A—h brand salmon pink or brown; f small, dark (or rarely pale) brown. F—ocellus upf situated in a more or less pale area, outwardly and inwardly defined by a narrow dark line; the ocellus ring diffuses into this area and is never narrow, of uniform width or sharply defined.
- a. F—WSF often very dark below and with small ocelli. DSF pale area often very extensive.
- mineus polydecta*, Cr., Ceylon—Bengal. 1.7—2.0.
- b. F—larger.
- mineus mineus*, L., Kulu—Burma. 1.8—2.1.
- c. F—darker; ocelli below larger.
- mineus nicobarica*, M., Nicobars. 1.8—2.1.
20. (17.27.28). A—f brand extends from under origin  $v^2$  to at least under origin  $v^3$  and often much further.
21. (24). A—f brand in WSF extends to beyond outer edge of the discal band; in DSF to under origin of  $v^3$  or  $v^1$ , but if not through the discal band, the latter is bent outwards between  $v^1$  and  $v^2$  and sharply angled at  $v^1$ .
22. (23). A—h brand brown or pale yellow; f brand pale yellow or brown in DSF; in WSF inner half brown and outer half pale yellow. F—resembles 19. a as regards the pale area upf in the DSF but unf discal band always angled at  $v^1$  in DSF and always up to  $v^1$  in WSF, being outwardly curved before reaching it.
- igilia*, Fr., Travancore, Coorg, Mysore. 1.6—1.9.
23. (22). A—h brand pale brown; f usually pale brown, sometimes brown especially in DSF from the C. P. and Burma.
- a. F—DSF apex sharp pointed and termen straight; WSF more rounded; WSF ocellus above large and well defined.
- visala visala*, M., Central Prov., Kumaon—Assam. 1.9—2.3.
- b. F—apex more rounded; ♀ not distinguishable from 26c.
- visala neovisala*, Fr., Burma. 1.9—2.2.
- c. F—apex rounded; much darker.
- visala andamana*, M., Andamans. 1.8—2.2.
24. (21). A—f brand never to beyond discal band, though often up to it; discal band never angled at  $v^1$ .

25. (26). A—h brand black. F—WSF ocellus above with rather broad and prominent yellow ring; unf discal band reaches costa; apex f very rounded. DSF always more or less ocellated and with a wavy post-discal line beyond the ocelli more or less apparent.

*perseoides*, M., S. Burma. 1.8—2.0.

26. (25). A—h brand pale yellow.

a. F—above sub-terminal pale line is followed by 2 dark lines separated by a pale line and followed by the cilia, the inner half of which are pale and the outer half dark. In 19 this feature occurs more or less, but at any rate on the forewing of the ♀ the pale line is preceded by a prominent dark line bordering the ground colour. Above the ocellus has a narrow well defined ring, though often obscure; unf nearly always an ocellus in 1. WSF black below.

*subdita*, M., Ceylon, Nilgiris, Madras, Orissa. 1.8—2.0.

b. F—f apex very rounded; h termen very scalloped and almost caudate at  $v^4$ . ♀ termen f chequered. ♂ DSF always ocellated; ♀ very variegated.

*mercea*, nov. Pachmarhi (C. P.). 1.7—1.9.

c. Occurs in 3 forms, wet, intermediate and dry.

*hasia orcha*, Evans. Palnis, Coorg, Nilgiris. 1.8—2.0.

d. Occurs in 2 forms only, wet and dry.

*hasia hasia*, Evans. Assam—Burma. 1.9—2.1.

27. (17.20.28). A—f and h brand silvery white, hard to see on the nacreous ground. F—above dark ferruginous; ocelli ringed fulvous; usually ocelli in 5 f and 2 h above; below ochraceous with broad yellow discal band.

*rama*, M., Ceylon. 1.9—2.2.

28. (17.20.27). A—f no brand; h brand dark brown, tuft reduced. F—below pale brown, discal band broad, pale yellow. Wings very rounded.

*evansii*, Tyt., Manipur. Assam. 1.8—2.0.

29. (16). V—h bases of 6 and 7 approximate, lower dev in line with  $v^1$ . F—DSF dull ochreous below, always more or less ocellated. A—f no brand and h no brand, tuft white. C—h white brand below origin  $v^4$ , covered by recumbent tuft black hairs rising beyond middle of cell;  $v^1$  swollen and covered by recumbent tuft of black hairs.

*mystes*, DeN., Manipur—N. Burma. 1.8—2.0.

30. (15). F—normally 3 ocelli uph (may be 2 or 4). Above very dark ferruginous brown. A—h brand black, tuft brown. V—5 and 6 well separated at base.

31. (32). F—above large ocellus in 2 f and ocelli h ringed fulvous; unringed ocellus in 2 f. A—no brand f, tuft h very inconspicuous.

*adolphi*, Guer., Nilgiris, Coorg. 1.9—2.2.

32. (31). F—large ocellus in 2 f on a wide fulvous area; ocellus in 5 f minute or absent; h ocelli ringed fulvous or on a fulvous area. Termen h caudate at  $v^4$ . A—f brand small, black.

*oculus*, Mar., Palnis, Travancore. 2.0—2.4.

33. (12.51). V—origin  $v^3$  before end of cell.

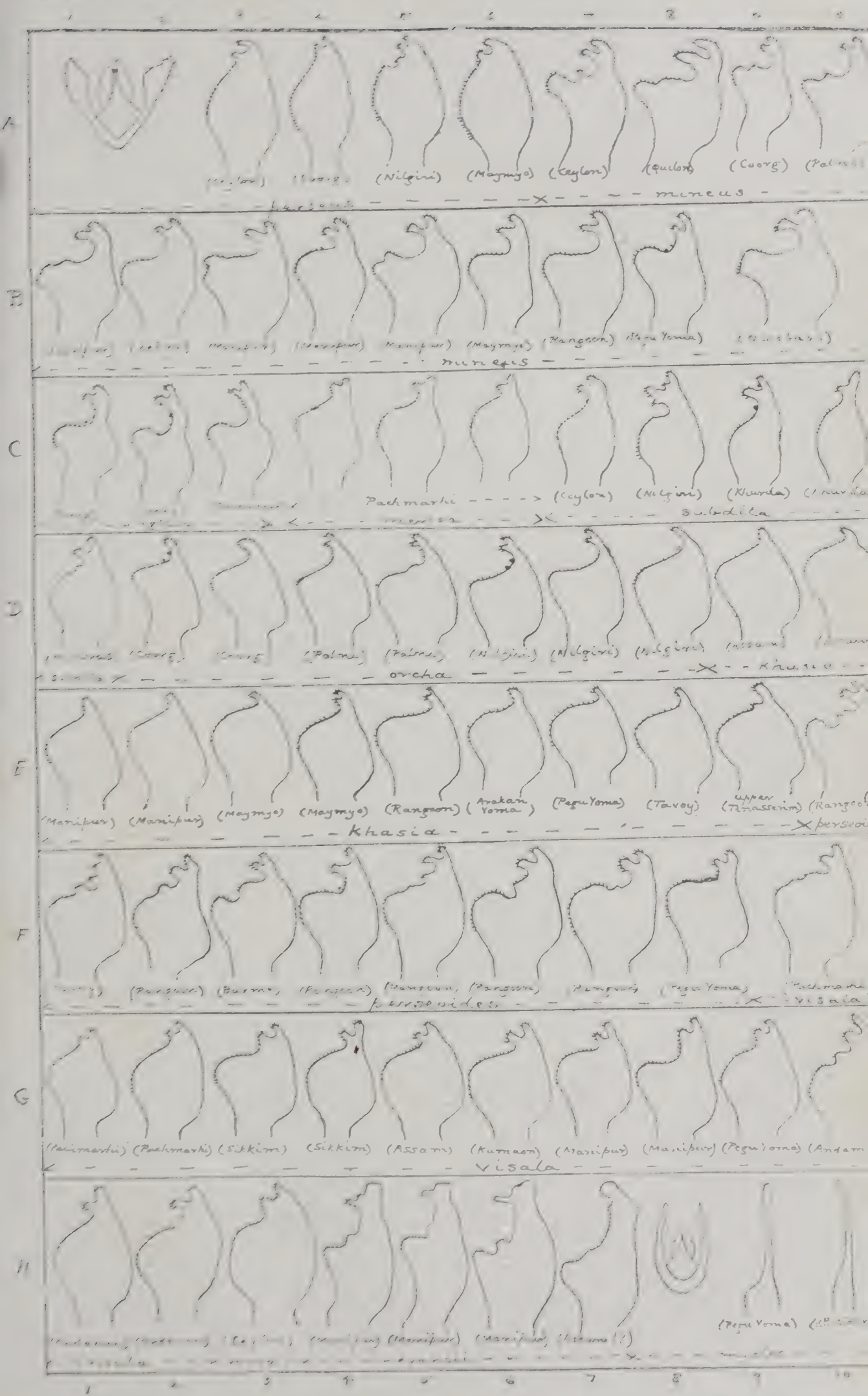
34. (45.50). F—above pupilled ocelli present in 2 and 5 f and 2 h (5 f sometimes absent in 39).

35. (36). F—below dark discal line. Apex f produced. Above ochreous brown; ocellus in 2 f very large, with broad yellow ring; minute ocelli 5 f and 2 h. Below pale. A—f no brand but prominent square white patch in the usual nacreous area; h brand golden brown, tuft bright yellow. C—absent.

*mnasicles perna*, Fr., S. Burma. 2.3—2.7.

36. (35). F—below pale yellowish discal band.









37. (38). F—below uniform, unmottled. Cilia white. Above prominent ocellus in 2 and 5 f and 2 h; 5 f slightly larger than 2 h and slightly smaller than 2 f. A—f brand small, pale yellow; h brand pale yellow, tuft pale brown. C—long erect dense brown hairs along basal portion v<sup>1</sup> h.

*suavolens*, Wm., Sikkim—N. Burma. 2.3—2.7.

38. (37). F—below basal portion mottled. C—absent.

39. (40). F—cilia white. Above ocelli small; 2 f and 2 h equal, 5 f minute or absent. Below f in addition to ocellus in 2 only 2 obliquely placed apical ocelli; h ocellus in 3 absent. A—f brand minute, black; h brand small, black; tuft brown.

a. F—upf white discal band obscure.

*mestra vetus*, Fr., Sikkim, Bhutan. 2.5—2.7.

b. F—upf white discal band prominent.

*mestra mestra*, Hew., Assam. 2.5—2.7.

40. (39). F—cilia pale brown. Above ocelli larger; 5 f and 2 h equal, 2 f much larger. Below ocelli complete and f all in line.

41. (42). F—uph in addition to ocellus in 2, always one in 3 and usually in 4, rarely also in 1. upf ocellus in 2 very large. A—f no brand; h brand black, tuft brown.

*heri*, M., Kumaon—Bhutan. 2.5—2.8.

42. (41). F—uph rarely more than the ocellus in 2, if more very small.

43. (44). F—below outer basal area before discal band nearly black, mottling confined to the base. A—f brand small salmon; h salmon tuft yellow brown.

*misenus*, D<sup>c</sup>N., Sikkim—Assam. 2.3—2.5.

44. (43). F—below brown all over and mottled up to discal band; ocellus in 2 upf much larger than the rest. A—brands f and h and tuft black.

a. See b.

*nicotia nicotia*, Hew., Mussoorie—Burma. 2.1—2.3.

b. Above ocelli larger; below band wider.

*nicotia nudgara*, Fr., Tenasserim. 2.2—2.4.

45. (34.50). F—above ocelli blind. Below mottled; pale yellow or white discal band. A—f and h brands black, tuft brown. C—absent.

46. (47). F—above white discal band clearly defined.

*malsara*, M., Sikkim—Burma. 1.9—2.1.

47. (46). F—above white band not visible.

48. (49). F—upf nearly always sub-equal ocelli in 3 and 5 as well as the normal one in 2; rarely an ocellus in 1. uph always an ocellus in 2 and 3 even when the ocelli upf are reduced to a single one in 2. Cila brown.

a. see b.

*mamerta mamerta*, Cr., Assam—Burma. 1.8—2.0.

b. wings more elongated; termen h very scalloped.

*mamerta annamitica*, Fr., Tenasserim. 1.9—2.1.

49. (48). F—upf normally no ocellus in 3, if present smaller than the ocellus in 5; uph there may be ocelli in 2 and 3 but always absent if the ocellus in 5 f is absent.

a. Cilia white, prominently chequered at ends of veins.

*lepcha davisonii*, M., Palnis, Animalai hills. 1.8—2.0.

b. Cilia brown. Band below wide, outwardly ill-defined.

*lepcha bethami*, M., Central Prov. Orissa. 1.8—2.0.

c. Cilia brown. Band below narrow, thread like or obsolete towards costa f.

*lepcha lepcha*, M., Kulu—Kumaon. 1.8—2.0.

d. Cilia white, not chequered. Very dark above and below.

*lepcha kohimensis*, Tyl., Assam—Burma. 1.8—2.0.

50. (34.45). F—above unmarked, prominent double ante-terminal line; below uniform, discal band lilacine; ocelli in 2 and 3 h larger than the rest.

Wings very rounded. A—f brand absent or minute, dark ; h brand black ; tuft brown, inconspicuous. C—h bases 2, 3 and 4 slightly swollen and covered with scattered erect hairs.

*malsarida*, But., Assam. 1·8—2·0.

51. (12.33). V—origin  $v^3$  far beyond end cell h. A—f no brand ; h brand black ; tuft pale brown. C—absent. F—above dark brown, ocellus in 2 f set obliquely at lower, outer, edge of a pale area ; minute ocellus in 5 f (often absent) ; these ocelli pupilled ; no ocellus h. Below not mottled.

a. F—pale area above fulvous and a broad fulvous patch in cell f. Below fulvous.

*patnia patnia*, M., Ceylon. 1·5—1·7.

b. F—pale area above white and not in cell. Below rather pale brown.

*patnia junonia*, But., South India. 1·6—1·9.

52. (11). V—f origin  $v^{10}$  well beyond end cell. A—f small dark brand h brand pale yellow ; tuft pale yellow. C—h small dark brand above origin  $v^6$  ;  $v^1$  distorted towards  $v^2$  resulting in a fold of the wing, over which there is a recumbent tuft of brown hairs. F—above brick red, blind ocellus in 2 ; below very dark, not mottled.

*oroatis surkha*, Mar., Tenasserim. 2·0—2·2.



SOME NOTES ON THE GENUS *CAPRIMULGUS*  
(*NIGHTJARS*) IN THE PUNJAB.

BY

HUGH WHISTLER, F.Z.S., M.B.O.U.

WITH A NOTE ON THE NIGHTJARS OF SIND BY DR. C. B. TICEHURST.

It has for some time past been apparent to me that our knowledge of the Nightjars or Goatsuckers which appear in the Punjab is most incomplete. The reasons for this are not far to seek. In the first place the genus is a very difficult one to study from the nocturnal habits of its members, and the fact that so far as my experience goes it is almost impossible to distinguish the various species in the field unless the call notes are heard and recognised. Secondly, even after an individual has been shot, specific identification is not by any means easy unless the observer has previous acquaintance with the different kinds, or has specimens available for comparison; as the various characteristics do not readily lend themselves to written description.

Thirdly in addition to the above special reasons there is the general fact that, until late years, the Punjab has been neglected Ornithologically as much as any provincial area of India.

Accordingly I recently collected all the records that were within my reach so far as they concerned the Punjab (in the political sense including certain mountain areas), or other contiguous areas, which might be expected to throw light on the status of the birds in the Punjab. The result was to show very clearly that in none of the six species concerned was our knowledge in any way complete; indeed as regards several it is most incomplete. It then occurred to me that it might be of interest to publish the result of my survey in the hope and belief that a clear view of these woeful gaps might encourage the placing on record of individual records or other particulars of interest, which must be within the knowledge of many of our members. The size of the country, the sparseness of the European population, the fact that such population is mainly official and very busy, and the entire absence of scientific proclivities amongst the Indian population, are such that there is no possibility of the general and exhaustive knowledge of the avifauna which exists in the British Isles. It is therefore all the more incumbent on those of us who are interested in the subject to place in print such facts that come to our notice in order that they may be available for the next observer in the area. In England the Ornithologist everywhere is the heir to an exhaustive literature and an oral tradition, and generally a personal introduction to the study of his science. In India each observer in each district starts afresh, or after a considerable gap of some twenty to forty years, and has to assist him but a scanty literature. Under these circumstances there cannot be too strongly impressed on every one the value and importance of recording observations however disconnected or fragmentary.

In these notes I have not touched at all on questions of plumage or oology, but on these points too, more information is badly required. Writing, far away from Museums and Libraries, with only a portion of my own books and specimens available I have doubtless overlooked some records, and should be grateful to any one who would bring them to my notice. As I have tried to emphasise above, this article is intended to emphasise not our knowledge, but our lack of it, in the hope that some of the gaps may be quickly filled.

The Key given below may perhaps be a useful supplement to that given in the "Fauna of India Birds", (Blanford and Oates) on which individual specimens do not always work out correctly.

Finally I would urge all members interested to endeavour to obtain and submit for competent identification any Nightjars about which they are doubtful, especially all Nightjars which are caught at sea on board ship on the voyage between India and England. Nightjars frequently come aboard and often can be caught.

# KEY TO PUNJAB MEMBERS OF THE GENUS *CAPRIMULGUS*.

(Note: White includes buff.)

1	{	2 outer pairs of tail feathers with large white terminal spots .. .. .	2	
		4 outer pairs of tail feathers with white sub-terminal spots .. .. .		<i>indicus</i> ♂
		Outer tail feather without white spots ..	5	
		2 outer pairs of tail feathers entirely white except at the tip .. .. .		<i>monticola</i> ♂
2	{	Wing under 160 mm. .. .. .		<i>asiaticus</i> ♂ ♀
		Wing over 160 mm. .. .. .	3	
3	{	Large white spots on 1st four primaries ..	4	
		Large white spots on 1st three primaries ..		<i>macrurus</i> ♂
4	{	General tint above sandy grey. Black spots on crown transverse .. .. .		<i>mahrattensis</i> ♂ ♀
		General tint above silvery grey. Black spots on crown lanceolate .. .. .		<i>unwini</i> ♂
				<i>unwini</i> ♀
5	{	Large white spots on 1st three primaries ..		<i>unwini</i> ♀
		Large white spots on 1st four primaries ..	6	
6	{	General colour above dark brown with black markings .. .. .		<i>indicus</i> ♀
		General colour above dark brownish grey with rufous markings .. .. .		<i>monticola</i> ♀

## THE JUNGLE NIGHTJAR, *CAPRIMULGUS INDICUS INDICUS*. Lath.

The Jungle Nightjar has been divided into three races, the typical form *C. indicus indicus* (wing in ♂ 197-203 mm.) found in India, replaced in Ceylon by the smallest race, *C. indicus kelaarti*, with a wing in the male of 173-183mm. The third form is *C. indicus jotaka* of S. E. Siberia, China, Japan and other eastern localities which is larger, with a wing in the male of 212-224mm.

There has been a certain amount of confusion regarding these Nightjars as the various races intergrade with one another both in size and colour and it is impossible to be sure of the correct identification of individuals. Under the circumstances therefore so far as the Punjab is concerned (lying in the extreme N. W. corner of the entire range of the species) I propose to treat all records of the Jungle Nightjar as referring to *C. indicus indicus*, irrespective of the name under which the record was made. Since, from the geographical position of our area, it is extremely unlikely, whatever may be the case in other parts, that the status of the sub-species may be confused by migration from the areas of the other two races.

I find the following records:—

Ratray took a clutch of eggs at Fort Munro, Baluchistan border, on 28th July 1904, which is figured in the Journal B. N. H. S. Vol. xvi, p. 660. The bird is apparently not uncommon about Hazara and the Galis. Hume



mentioned it at Abbottabad (S. F. vi 56-57); it is included with the remark "breeds in Galis" in Buchanan's list of Hazara birds in the gazetteer of that district. Rattray took 2 very hard set eggs near Dunga Gali on 7th June 1904 (Jour. B. N. H. S. xvi, 660) but Magrath reports it as rare at Thandiani (Jour. B. N. H. S. xviii, 284); according to a marginal note by Andrew Anderson in my copy of Jerdon it "lays in Murree."

About Simla it is common according to G. F. L. Marshall (Journal Simla N. H. S. 1886, p. 7) and A. E. Jones (Jour. B. N. H. S. xxvi, 614), the latter adds the information that it prefers the barer hill side contiguous to jungle and ascends to 6,000 ft.

The information regarding the Punjab plains is very meagre. Hume implies that it occurs (S. F. vi, 56-57) and a female from the Hume collection obtained at Sirsa (no date) is catalogued by the British Museum.

Mr. A. H. Marshall, Indian Police, informs me that he shot a specimen at Kasinda, Rohtak district, in December 1910.

I have never obtained the Jungle Nightjar personally. The call is variously described as "*tew-yo-yo* frequently repeated" (Jerdon), a plaintive "*choo-yo-yo*" (G. F. L. Marshall), a rapidly repeated "*Chuck-Chug-Chuck*" (Magrath), and a continuously uttered "*tchouk, tchouk, tchouk*" (Dresser.).

#### UNWIN'S NIGHTJAR, *CAPRIMULGUS EUROPÆUS UNWINI*, Hume.

This Nightjar is the Eastern race of the Common European Nightjar *C. europæus europæus*, Linn; and was first described by Hume from Hazara, in the Ibis. 1871, p. 406. The original description will be found reproduced in Stray Feathers Vol. III, 407. It differs from *C. europæus* in that the general tint is slightly greyer and paler. The white spot on the inner web of the first primary in the male always extends to the shaft and touches it as a rule for a space of 10 to 15 mm. The white spot on the second primary is not confined to the inner web but is always continued to the outer web in the form of a white band. The under tail coverts are usually but very faintly barred and frequently are quite unmarked.

In size this race is smaller with a shorter wing on the average. Wing of adult as a rule 180-186 mm. (as against 190-202 mm. in *C. europæus europæus*) but extremes of 174 and 194 mm. have been recorded.

The restricted distribution of this Eastern form is thus given by Hartert (Vog. Pal. Fauna ii, 849):—

"The breeding bird in parts of Turkistan (Ferghana) Transcaspia, Persia (at all events in E. and S. W. Persia), Afghanistan, Baluchistan, the Pamirs, Kashmir and Gilgit: a winter visitor to Sindh, the Punjab, and occasionally to the N.-W. Provinces (Etawah). A specimen was caught on a ship off Cape Gardafin on 6th November; occasionally also in South Africa (Natal)."

In endeavouring to amplify the above distribution I have discovered the following records with regard to Unwin's Nightjar.

At Quetta, Delme-Redcliffe, Marshall, and Meinertzhagen have found it to be a fairly common summer visitor and breeding (Jour. B. N. H. S. xv., 351; xxiii, 363; xxiv, 158). At Chaman just over the border in Southern Afghanistan, Barnes recorded it long ago as not uncommon and breeding in May, before which month he apparently did not observe it (S. F. ix. 215 et 453).

Then at Thall, Rattray and Whitehead both found it to be common in summer, and the former took 10 nests (Jour. B. N. H. S. xii, 343; Ibis 1909, 253).



In Gilgit, Biddulph and Scully reported it to be a common summer visitor arriving early in May and breeding about 5,000 ft. in the valleys (S. F. ix., 313; x, 101, et 261).

Hume obtained specimens from the Hazara and Agrore Valley including a female from Murree (10th May). (S. F. iv, 501, Cat. Brit. Mus). Cocks and Marshall took three nests about 5,000 feet near Murree in May (S. F. i., 350). In the same region Rattray considered the species not common and only recorded it near Dunga Gali where he took two nests (Jour. B. N. H. S. Vol. xvi, 660.). I have no breeding record east of Murree.

To sum the above up, it is clear that Unwin's Nightjar is a summer visitor and breeding species from May onwards in the lower hills and valleys of the chains of mountains which run up and down the north westerly and north-easterly frontiers of the Punjab. It is also extremely probable that a small number breed in the Salt Range as I obtained a male with the testes greatly enlarged near Choa Saidan Shah on 26th May 1913 (Ibis. 1916, 84) and similar stragglers may be expected in the contiguous low ranges such as the Kala-Chittar, and the broken country about Rawalpindi.

The question next arises as to what becomes of these Nightjars in the winter; Hartert says that the bird is a winter visitor to Sindh, the Punjab, and N. W. Provinces, *i.e.*, the United Provinces, but I cannot find the evidence on which this is based.

Whitehead says that it passes through Kohat in spring and autumn (Ibis. 1909, 253) and Doig has recorded that it is a passage migrant for a short time in September to the Eastern Narra, Sind (S. F. viii, 372.) The only other record that I have traced for the Punjab and Sindh is a female in the Hume Collection, obtained near Sirsa, but the date is not given in the B. M. Catalogue, (see also S. F. iv, 501).

My own records are scanty; an adult female was shot on the Canal bank at Gujranwala on 1st August 1915 and two other Nightjars seen about the same time (6th July and 5th August) were probably of the same species; these would all be on the autumn migration.

In Jhang district I have obtained three specimens only, one at Kot Lakhana (on the Lyallpur border) on 27th September 1918, a female at Jhang on 3rd May 1919, and one at Chund on 20th August 1919. These birds were all doubtless on passage. I have a few records of Nightjars seen but not identified in various districts and some of these may refer to this species, but the number of such records is not great and there is no use in quoting them in the absence of identification.

The above data would point to the fact that Unwin's Nightjar is only a spring and autumn passage migrant in the Punjab and it would be interesting to know what are its true winter quarters. It does not appear to me that they are fully known as yet and any authentic records bearing on its distribution in time and place are therefore to be welcomed.

The call note of this sub-species does not appear to have been described.

#### SYKE'S NIGHTJAR, *CAPRIMULGUS MAHRATTENSIS*, [Sykes.

This Nightjar inhabits Baluchistan, Afghanistan and the plains of North-Western India extending South to Belgaum and eastwards to Upper Bengal. It appears to be closely related to *Caprimulgus nubicus*.

To examine its distribution more closely, I find the following records. In Seistan, according to Cumming (Jour. B. H. S. xvi, 690), it is very numerous in summer from April to September, breeding all over the gravel-strewn "dasht" in May and June; he does not specifically note that it migrates in winter but his words appear to point to that conclusion, which is probably correct, as Rattray records that at Thall the species is

a fairly numerous summer visitor arriving about the middle of May and breeding in June and July. Here it frequents the more open hill sides and nullahs and is not found in jungle. (Jour. B. N. H. S. xii. 343).

A pencil note by Andrew Anderson, the well known naturalist of the seventies, in my copy, of 'Jerdon's Birds of India' is my authority for stating that Sykes' Nightjar breeds in the Murree hills. At Bannu, Magrath procured several in September probably on migration (Ibis 1909, 253). In the Eastern Narra, Sindh, Doig recorded the bird as a permanent resident and it is said to breed there from February to July (S. F. viii, 372). Hume procured a single male on the extreme northern border of Sindh, where the Indus river leaves the Punjab, on the 13th December.

The above records suggest that Sykes' Nightjar is a resident in the plains, and a summer visitor to the hill areas of its range, the latter presumably wintering in the plains with the resident birds. If this deduction is correct I presume that it is a permanent resident in the Punjab; it is in any case not common. The only records which I can trace are those of the British Museum Catalogue and a single bird obtained at the end of October near Lahore by Currie (Jour. B. N. H. S. xxiv, 570). The Catalogue includes ♀ ♂ Delhi (no date), ♀ Bhahawalpur (Feb. 14), ♀ ♂ Ambala (Feb.), four males and a female from Sirsa (February, July), all from the Hume Collection.

I have only met with this species on three occasions, all in the bed of the River Sutlej, one at Phillour on 10th May 1910, and a pair shot near Jellalabad (Ferozepur) on 25th February 1912.

These various dates for the Punjab support the assumption that the bird is a permanent resident. The call is described by Cumming as like that of a frog.

#### THE COMMON INDIAN NIGHTJAR, *CAPRIMULGUS ASIATICUS ASIATICUS*, Lath.

The distribution of the Common Indian Nightjar is given in the Fauna of British India series, "Birds", Vol. iii., 187; as from Sind and the Punjab through India and Ceylon, and in Burma as far south as Moulmein. But since that account was written the birds inhabiting Ceylon have been separated under the name of *C. asiaticus minor*, Parrot (Orn. Monatsbr. 1907, p. 170) and it is probable that when sufficient material is available the birds of the remaining areas may require some division into sub-species. In the meantime our Punjab birds must remain as *C. asiaticus asiaticus*.

The species has lately been recorded from Southern Tibet, Mipi, Dibang Valley, 4,800 ft. 13th May 1913, by Capt. Bailey (Jour. B. N. H. S., xxiv. 76).

As regards the Punjab there is but little on record. In Hume's 'Nests and Eggs' (2nd edition, Vol. iii, 48) Cock records a nest found at Dharmsala and says "The bird does not remain with us during the winter, but comes up about April and departs about August," and implies that it is common.

In the Catalogue of the British Museum I find the following specimens from the Hume collection, namely two males and a female from Gurgaon (December and February) and a female from Sirsa (Dec. 14) which is referred to also in Stray Feathers. (vii. 169).

Mr. A. H. Marshall, Indian Police, informs me that he shot a specimen at Silanah jheel, Rohtak District, in September 1910.

I have personally met with the species on two occasions. The first of these was on the 20th November 1914 when I shot one from a party of 2 or 3 which were resting in short grass amongst Uck plants in a small grove of Kikur trees near the Otu jheel, Sirsa. I heard the characteristic call near Chandighar in Ambala District on the nights of the 25th and 26th March 1916.



It is not clear from the above whether this Nightjar is a permanent resident or merely a winter visitor to the plains and its range in the Himalayan foot hills should surely be extended.

The call is well described as the sound made by a stone skidding over ice and is syllabised by Colonel G. F. L. Marshall as "*Chak-Chak Char-r-rk*" and by Jerdon as *tyook-tyook-tyook*. The latter adds that the bird when flushed rises with a low chuckle.

FRANKLIN'S NIGHTJAR, *CAPRIMULGUS MONTICOLA*, Franklin.

Franklin's Nightjar is found throughout a large portion of the plains of India, throughout the Lower Himalayas, in portions of Burma and in the south of China.

As regards our area the information is very deficient. At Thall, Rattray states that it is common and a permanent resident, and that he found it breeding plentifully (Jour. B. N. H. S. xii, 343).

A note by A. E. Jones (Jour. B. N. H. S. Vol. xxvi. 614) warrants the assumption that it breeds near Simla.

The British Museum Catalogue includes the following specimens from the Hume collection; two females and one immature bird from Delhi, male and female from Gurgaon district, three females and one male from Sirsa (all the above without dates), a female from Simla (March) and a male from Simla (April 15). Certain records by Currie (Jour. B. N. H. S. Vol. xxiv, 604) I omit as the birds were not fully identified.

Franklin's Nightjar, as it so happens, is the member of the genus with which I am best acquainted in the Punjab.

So far as I have observed the bird, and confirmed my identifications with specimens, the bird is a regular autumn passage migrant in some numbers, arriving and leaving suddenly, and being very local in its appearance. On these occasions it is confined to patches of ground where grow large clumps of the familiar 'Sirkana' or Pampas grass, whether such patches are growing on open sandy plain, around the edge of some jheel or tank or amongst the embankments of one of the larger railway bridges over our larger rivers. One such locality may be found full of the birds while similar ones around are empty. The only one of these patches of which I have been able to ascertain particulars for more than one year is visited annually, so it is possible that the birds follow definite lines of flight.

It is perhaps worth while giving details of my observations in case other observers in the same localities can supplement them.

I have omitted a number of records of single birds, which although they were probably of this species, were not definitely identified as such.

#### Ferozepore District, 1912.

Aug. 6th.—R. Sutlej bridge. 4 flushed and ♀ shot in a patch of thick grass jungle by pools of water at one portion of the embankments.

10th.—Another female shot from the same patch.

25th.—Some still about in the same place.

#### Hissar District, 1914.

July 24th.—Many reported to me at Hissar.

26th.—Great numbers found in a patch of bush jungle in the Government Bir near some flood water from the canal; there were none in other patches of similar ground. None were found in this place when I went again on 1st August.

Aug. —An unusual number of Nightjars noted singly during the month, but none definitely identified.



Sept. 1st.—Many in the grass and bush jungle partly flooded in an old famine relief work called Rajpura. Three birds were shot for identification.

13th.—Still common in the same patch of ground and two shot. I may note that this tank is surrounded by much similar ground yet the Nightjar appeared confined to the tank.

Note.—Mr. R. Branford, I.C.S., V.D., Supdt. of Government Cattle Farm, informed me that Nightjars had become similarly abundant in July and August 1915 and in August 1916.

Ludhiana District, 1917.

July 31st.—A flight of 9 or 10 observed in one portion of a sandy plain behind Civil Lines, covered with straggling patches of Sirkana grass. Specimens were shot and found to be heavy in moult.

Aug. 9th.—Two, apparently of this species, flushed in grass jungle near the Budhan nala.

10th.—Some on the embankment of the railway bridge at Ladhowal, one shot.

Sept. 15th.—Two flushed in the same place.

Jhang District, 1919.

Aug. 20th.—A solitary female shot from a borrow-pit at the side of the railway line near Chund bridge.

The call of this Nightjar is said to be very similar to that of *C. asiaticus*, but I have never heard it. When flushed in the day time individuals utter a low sort of chuckle not easily described.

HORSFIELD'S NIGHTJAR, *CAPRIMULGUS MACRURUS*  
*NIPALENSIS*. Hartert.

My only definite record of Horsfield's Nightjar for our area is that in the British Museum Catalogue of a male from Simla (March 5) in the Tweeddale Collection. It is there attributed to *C. macrurus albonotatus* but since that date the Nepalese and West Himalayan form has been separated under the name of *C. nipalensis*. Hume however describes a clutch of eggs taken at Dharmasala by Captain Cock (N. and E. 2nd Ed. III, 44).

G. F. L. Marshall (Jour., Simla N. H. S., 1886, 70) remarks in his description of Simla birds that it "ought to be heard in the valleys near" but does not say anything more definite.

The call is described by Jerdon (in addition to a low chirp, sometimes emitted on the wing) as the sound of striking a hammer on a plank, but Marshall (loc. Cit.) says that that gives little idea of the richness and volume of the sound "*Chounk Chounk*," repeated at intervals.

With reference to the above article on the Nightjars of the Punjab, appended is a brief summary by Dr. C. B. Ticehurst on the Nightjars of Sind and Baluchistan so far as there is any information.

SIND.

*Caprimulgus mahrattensis*.—Hume (S. F. Vol. I) says Nightjars are very rare in Sind and he met with this species on the Upper Sind Frontier, but that he was told Nightjars of sorts were common round Larkhana,

Mehur and the Munchar. Barnes says this species is very common round Hyderabad breeding in April and May and nests have been found as early as February. Doig considered it resident on the Narra, nesting on "Kuller" ground (bare, salt impregnated ground) and he found nests in May and July. I personally have met with species on several occasions in Lower Sind and I consider it to be resident and the Nightjar of Sind. I found it extremely common on the Narra and Jamrao canals in December, inhabiting jungle. In other places I have met with it in quite open desert.

*Caprimulgus europæus unwini*.—Butler recorded this species as an autumn passage migrant at Hyderabad during September and October arriving in August. This species appears to be a regular passage migrant in Lower Sind, and doubtless in Upper Sind also, on both spring and autumn passages. It does not so far as I know breed in Sind.

*Caprimulgus asiaticus*.—Murray records this species at Schwan on November 27th and Butler says it is not uncommon round Schwan in January. Beyond this I have no knowledge of this species in Sind and I have not met with it myself, even round Schwan. Why it should be so local and what its true status is I have no idea.

#### BALUCHISTAN.

*Caprimulgus mahrattensis*.—This species appears to be resident in Baluchistan in suitable places, but does not appear to occur in the higher mountainous regions, viz., Kelat-Quetta-Ziarat ranges. Cumming found it common in Seistan from April to September breeding April-June. It certainly breeds in the Paff Hills and probably in all the lower hills of Baluchistan. It extends westward as far at all events as Bahu Kelat on the border of Persian Baluchistan.

*Caprimulgus europæus unwini*.—This is the Nightjar of the higher mountains of Baluchistan to which it is a summer visitor. It breeds round Chaman in May (Barnes) and certainly must breed in the hills round Quetta, Ziart, Mastung, etc., as also in the higher hills round Panjgur in Central Baluchistan. To the lower hills and coast line as at Ormarsa it is a spring and autumn passage migrant as in Sind.

*Caprimulgus ægyptius*.—Does not come further east than Bampur in Persian Baluchistan.

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## REPORT OF THE COMMITTEE OF THE BOMBAY NATURAL HISTORY SOCIETY.

The Committee of the Bombay Natural History Society have the honour to submit herewith their report on the operations and progress of the Society covering a period from the signing of the Armistice in November 1918 to the 1st August 1920.

The Society was founded on the 15th November 1883 by certain Residents of Bombay "for the purpose of exchanging notes and observations on Zoology and Botany and exhibiting interesting specimens of animal life." In the month of May 1885, the Society divided its activities into separate sections to insure the more scientific treatment of zoological phenomena, and in January 1886 issued, under the editorship of Messrs. R. A. Sterndale and E. H. Aitken, the first number of its now well-known and popular Journal. This publication has now completed its 26th Volume.

The administration of the institution is directed by a Committee consisting of a President, three Vice-Presidents, an Honorary Secretary, Honorary Treasurer, and twelve members. The Museum and Library are in the charge of a Curator. The Editorship of the Journal is in the hands of the Honorary Secretary who is assisted by joint Editors.

The following is the Personnel of the management for the current year :—

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H. E. The Right Hon'ble Sir George Lloyd, G.C.I.E., D.S.O.

*Vice-Presidents.*—

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Mr. B. C. Ellison ; Mr. S. H. Prater (Acting).

*Managing Committee.*—

Mr. T. Bainbrigg Fletcher, F.E.S. ; Mr. T. R. Bell, C.I.E., I.F.S. (retd.) ; Rev. E. Blatter, S.J., F.L.S., Mr. E. Comber, F.Z.S. ; Col. G. H. Evans, C.I.E., F.L.S. ; Lt.-Col. W. H. Evans, R.E. ; Lt.-Col. J. E. B. Hotson, I.A.R.O., C.B.E. (I.C.S.) ; Mr. C. M. Inglis, M.B.O.U. ; Prof. V. N. Hate ; Major F. C. Fraser, M.D., I.M.S. ; Lt.-Col. W. Glen Liston, C.I.E., I.M.S. ; Mr. F. Ludlow, I.E.S. ; Mr. F. M. Macwood ; The Hon'ble Mr. P. J. Mead, C.I.E., I.C.S. ; Mr. H. P. Macnaghten, B.A. ; Mr. W. S. Millard, F.Z.S. ; Mr. P. M. D. Sanderson ; Lt.-Col. F. Wall, I.M.S., C.M.G., C.M.Z.S. ; Lt.-Col. H. J. Walton, I.M.S., C.M.Z.S. and Mr. John Wallace, C.E.

At the outbreak of War the number of members on the roll was 1,600. At the date of the Armistice the number was 1,775. On the 1st July 1920 the nominal roll stood at 1,841 but of these 499 had not paid their annual subscription for 1920. Included in the list of members are 102 life members who have compounded in one lump sum.

The Society takes its title from its origin and establishment in the City of Bombay, but its membership is spread throughout India, Burma and Ceylon. The roll of members includes also a number of learned Societies and individuals resident in Europe, America, Africa and Australia.



**Subscription and Entrance Fee.** The entrance fee is Rs. 10 and the annual subscription is Rs. 15 for which members receive the Society's Journals, post free, and the assistance of the Society on questions dealing with Natural History, and the identification of specimens and advice in the making of private collections. Suggestions of remedial measures in connection with House and Garden pests and supervision and advice in connection with the setting up and mounting of game trophies are among the advantages enjoyed by its members.

#### MUSEUM AND LIBRARY.

**Collections.** The Society's Museum contains 4,330 specimens of Mammals, 6,000 Birds, 3,200 Birds' Eggs, 3,700 Reptiles and Fishes, and 27,000 other Invertebrates in addition to Botanical specimens. The average monthly additions total about 80. The majority of the specimens are classified and arranged. The Society possesses a valuable reference Library containing over 1,000 Volumes mainly devoted however to the Natural History of the Oriental Region. The Museum is open to members and their friends from 10 A.M. to 6 P.M. on week days and 10 a.m. to 3 p.m. on Sundays and holidays.

#### FINANCE.

**Grant from Government.** The Society is almost entirely supported by the annual subscriptions of its members. It receives in addition an annual grant of Rs. 5,000, from the Government of Bombay. The Museum unfortunately suffers greatly from the Society's limited income.

**Treasurer's Report for year 1919.** The Honorary Treasurer's report for the year ending December 1919 is appended :—

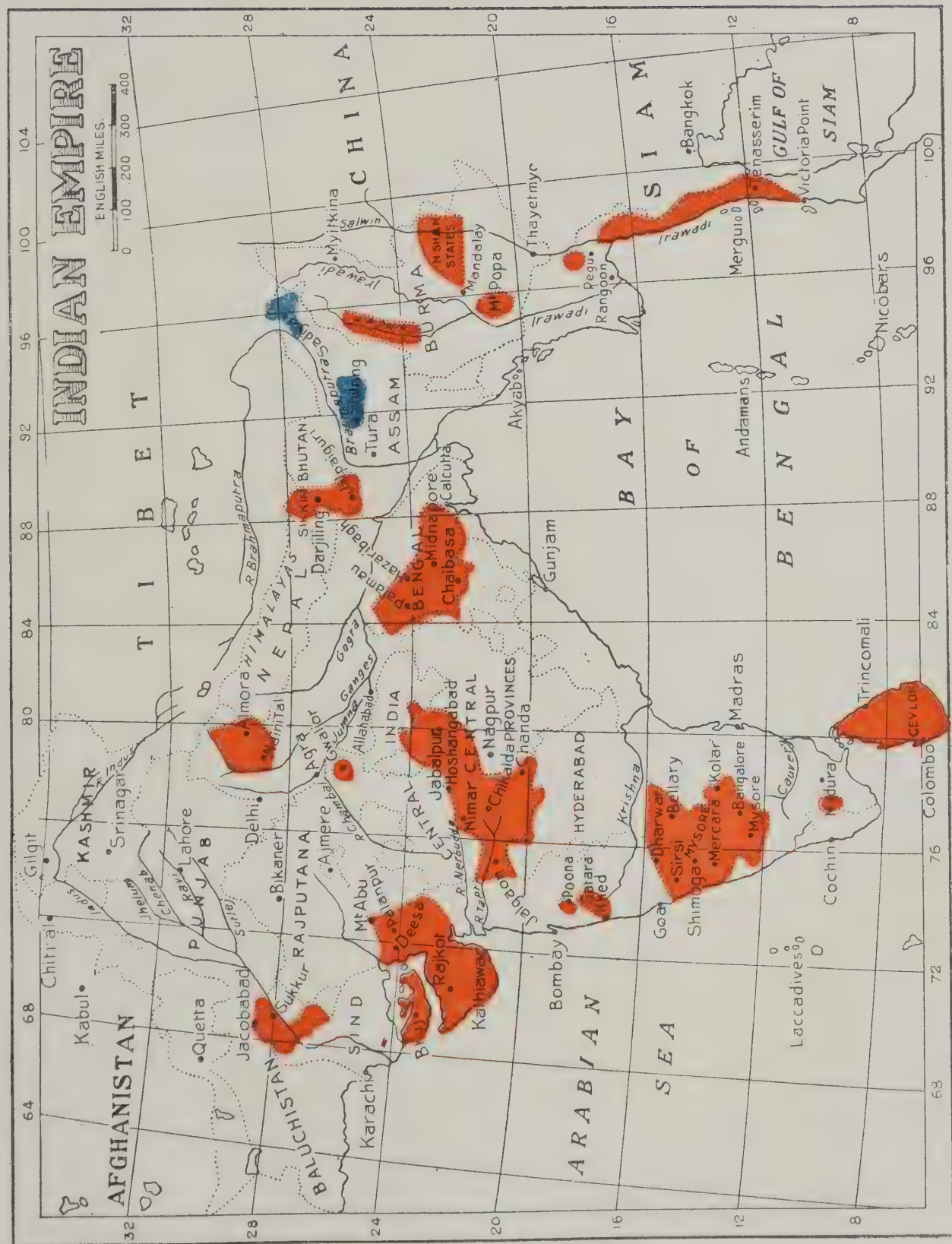
“ Mr. H. F. Lodge, the Honorary Treasurer, in presenting the accounts for the year ended 31st December 1919, said that a copy of the audited balance sheet was on the table for inspection of members and this would as usual be published in the Society's Journal. The following however were the main features of the accounts for the past year. On the 1st January 1919 the Society opened with a credit balance of Rs. 14,727-5-8 and during the year this figure decreased to Rs. 14,297-11-8, the cash balance shown on the 31st December 1919. The receipts during the year under review amounted to Rs. 33,767-4-8 which shows a decrease of Rs. 2,203, when compared with the corresponding figures of the previous year. The expenditure during the year 1919 amounted to Rs. 34,196-14-8 and this figure shows an increase of Rs. 9,719-10-11 over the corresponding figures for 1918.

The increase in expenditure was easily understood as the Society in common with every other institution had lately had to pay considerably more for every thing required to carry on its work. In spite of this the Society had not increased the annual subscription which remains at Rs. 15 and it was hoped to avoid having to do so. Indications for 1920 pointed to the fact that expenditure generally would be still further increased and to counteract the rise in prices every effort ought to be made to increase the revenue of the Society and this can best be done by the enrolment of new members. It is therefore hoped that members would do their best to interest their friends who were not already members in the work of the Society with a view to their being enrolled as members.

As regards the Mammal Fund the balance at the commencement of the year was Rs. 8,684-7-2 and the closing balance Rs. 12,389-2-5.”

#### EXPLORATION AND RESEARCH.

**Mammal Survey.** The most important work taken up in this connection has been the Mammal Survey of India, Burma and Ceylon. The Survey was instituted in the year







1912 with the object of making as complete a study as possible of the occurrence and distribution of mammals found in India, Burma and Ceylon and with the further object of supplementing the collection of Indian Mammals at the Society's Museum and the British Museum as well as the collections of other Museums and scientific establishments in India.

The funds necessary for the promotion of this work were obtained principally through individual subscription and through grants provided by various Governments. The European War put an end to this Mammal Survey so far as work done by collectors in the employment of the Society was concerned, as the four collectors employed—Messrs. Shortridge, Mayor, Crump and Macmillan—joined the Military forces of the Empire at the earliest opportunity, Capt. Macmillan laying down his life at Ypres and Mr. Crump, who obtained the M. C., being severely wounded.

The interest of the Society in a systematic collection of the smaller mammals was not however overlooked by the members of the Society. From the nature of the War many members who were active contributors were collecting outside or on the very borders of the territory selected for the scope of the Mammal Survey, and good collections were received from Lt.-Col. J. E. B. Hotson, I.C.S., I.A.R.O., in Mekran and Persia, Capt. Ingoldby, R.A.M.C., in Waziristan, Mr. J. P. Mills, I.C.S., in Assam, and from many members in Mesopotamia—especially Sir Percy Cox, K.C.S.I., Major R. E. Cheesman and Lt.-Col. F. P. Connor.

The demobilisation of men after the signing of peace enabled the Society to resume the work of the Mammal Survey so far as that was done by collectors definitely engaged for the purpose. None of the old collectors still alive has so far been able to return but in the autumn of 1919, Mr. H. W. Wells commenced work in Assam on the borders between India and China.

Though the difficulties of collecting are greater in Assam perhaps than anywhere else in India, and are particularly difficult to a newcomer, this part of the country was selected as the scientific results to be obtained from a systematic survey are likely to be greater here than anywhere else in India. Difficulties would moreover be lessened through the help to be obtained from members of the Society resident in Assam and particular thanks are due in this respect to the Hon'ble Sir Nicholas Beatson Bell, K.C.I.E., C.S.I., Mr. J. P. Mills, I.C.S., Mrs. Jackson, Mr. L. Bishop, Capt. W. J. H. Ballantine, Mr. H. O. Allen, Mr. A. Locket, Mr. A. M. Primrose and Mr. A. J. W. Milroy.

The Government of Assam kindly made a grant of Rs. 1,000 towards the expenses of the Survey, and Government officials have at all times given all the help and assistance possible to our collector.

The results of the Mammal Survey so far as the discovery of new Genera and Species, and sub-species are concerned are referred to under the heading "Publications" at the end of this report.

The work of the Mammal Survey has now been carried on in Upper Sind Frontier (Mr. S. H. Prater), Cutch and Kathiawar and Gujarat (Mr. C. A. Crump), Satara and Ratnagiri Districts (Mr. S. H. Prater), S. Kanara and Mysore (Mr. G. C. Shortridge), Madura (Mr. S. H. Prater), Almora (Mr. C. A. Crump), Gwalior (Major E. W. Mayor), East Khandesh, Berars and part of the Central Provinces (Mr. C. A. Crump), Bihar and Orissa and the Midnapore District of Bengal (Mr. C. A. Crump), Sikkim and Darjeeling and the Bengal Terai (Mr. C. A. Crump), the Chindwin River, South Shan States, Dry Zone, Burma, Mergui and Tenasserim (Mr. G. C. Shortridge and Capt. Macmillan) the Pegu District, Burma (Mr. J. M. D. Mackenzie), Ceylon (Major E. W. Mayor).

For easy reference a map showing the districts already collected in is appended hereto. The area worked up to the Armistice is coloured in red. The

parts now being worked are coloured in blue. Assistants are being trained for the work and it is hoped that this year the Society will be in a position to take advantage of the offer of H. H. The Maharaja Scindia of Gwalior to give facilities to our Collector to work in and round Sipri where the red and black soils meet, and also of the very valuable offer by Dr. Anandale, the Director of the Zoological Survey of India, to give assistance to a collector working round the shores of the Chilka Lake in Orissa where Dr. Anandale has a bungalow and has himself already obtained very valuable scientific results from collections of fresh water fauna.

For purposes of scientific classification, all material collected by the Society's Mammal collectors is sent to England to the British Museum where it is arranged and classified by those who have made a life-long study of Mammals from all parts of the world. After satisfying the requirements of the National Museum the collections will be returned to the Society who will distribute the surplus named specimens amongst various Museums in India and elsewhere.

The Results of the Survey in the shape of "Scientific Results" and "Reports" are written at the British Museum by Mr. Oldfield Thomas, F.R.S., and Mr. R. C. Wroughton, formerly Inspector General of Forests in India, and are published in the Society's Journal. Mr. Wroughton has also published a 'Summary of the Results of the Mammal Survey' which brings the work on 'Mammalia' in the "Fauna of British India Series" more or less up to date so far as small mammals are concerned. The Volume published in the above series having been issued so long ago as 1891 had for many years become obsolete. In this respect the Survey has already proved its great usefulness.

Besides our work on Mammals, the Society was able to publish most exhaustive reports on the Flora of the Indian Desert, including observations on the Geology and Meteorology of what is described as the least known of the Indian Plains. The thanks of the Society are due to Rev. E. Blatter, S.J., and Prof. F. Hallberg for their exertions in this connection. Father Blatter and Prof. Hallberg, accompanied by Mr. S. H. Prater of this Society, had moreover in 1915 made a trip through the High Wavy Mountains in the Madura District, Southern India, from which good Botanical and Zoological results were obtained.

Through the Agency of Col. J. E. B. Hotson, C.B.E., I.C.S., I.A.R.O., very valuable and interesting collections of mammals, birds, reptiles and plants have been made in the above countries. The advancement in our knowledge of the fauna and flora of these regions, due to the systematic collecting of Col. Hotson, is shewn to some extent in the number of new genera and species discovered by him, and the information gained as to the geographical distribution and range of species in these little known tracts.

During the War a large number of contributions were received from members serving with the forces in Mesopotamia. The contributions include valuable collections of Mammals, Birds, Reptiles and Insects. These collections are now being worked out by experts in England, and the results of their researches will be published in the forthcoming issues of the Journal. At the request of the Civil Commissioner, Bagdad, it has been decided to collect the various papers at the close of the series and issue them as a separate publication. As such it will constitute a valuable work on the Fauna of the country.

We have to record the exceedingly valuable work done by Mr. E. C. Stuart Baker in the preparation of a "Hand List of the Birds of British India" to be issued by the Society in a similar form to the "Hand List of British Birds" published by the British Ornithologists' Union. Oates and Blanford published their books on Birds in the Fauna of British India series between 1888 and 1898. The considerable amount of research work done since that period, together with the introduction of the trinomial system, has altered a number



of the names and rendered Oates and Blanford, until amended in this respect, of little value to the Ornithologist. Mr. Stuart Baker's work goes far towards making good this defect.

Further, with a view to showing the distribution of birds in India, the following lists have been published during the period under review:—

The Birds of Prey of the Punjab. By C. H. Donald, F.Z.S.

Birds of the Ludhiana District, Punjab. By H. Whistler, M.B.O.U., F.Z.S.

A List of Birds found in the Simla Hills. By A. E. Jones.

A Tentative List of the Vertebrates of the Jalpaiguri District, Bengal (With Plates) By C. M. Inglis and others.

#### PUBLICATIONS.

The Society's Journal published during the period under review contained the following contributions to Scientific Biology:—

THE SCIENTIFIC RESULTS OF THE MAMMAL SURVEY No. 18, BY MARTIN C. HINTON AND NOS. 19, 20 AND 21, BY OLDFIELD THOMAS, F.R.S., R.C. General  
logy.

WROUGHTON AND WINIFRED M. DAVIDSON.

Martin Hinton's paper comprises a report on House Rats of India. It is based on the enormous amount of material collected by the Survey and is a valuable monograph on the distribution and races of the genus *Rattus* in India.

Mr. Oldfield Thomas' papers form a synopsis of the groups of True Mice found within the Indian Empire and deal with new species of Mammals found in Baluchistan and N. W. India.

The 21 papers on the Mammal Survey hitherto published comprise descriptions of 6 New Genera, 68 New Species and 83 New Sub-species.

SUMMARY OF THE RESULTS FROM THE INDIAN MAMMAL SURVEY OF THE BOMBAY NATURAL HISTORY SOCIETY, PARTS, 2, 3, 4 AND 5. BY R. C. WROUGHTON, F.Z.S., M.B.O.U.

Mr. Wroughton's papers are a revision of the present day genera, species and geographical distribution of Indian Mammalia in special reference to Blanford's Volume on Mammalia in the Fauna of British India series.

A NEW SPECIES OF NESOKIA FROM MESOPOTAMIA, BY OLDFIELD THOMAS, F.R.S.

SOME NEW MAMMALS FROM MESOPOTAMIA, BY OLDFIELD THOMAS, F.R.S.

These papers deal with descriptions of new mammals obtained by the Society's members in Mesopotamia and are published by permission of the Trustees of the British Museum.

ASIATIC STARLINGS BY CAPT. C. B. TICEHURST, R.A.M.C.

The paper deals with the classification and geographical races of the Genus *Sturnus* found in Asia.

A MESOPOTAMIAN BULBUL, BY CAPT., C. B. TICEHURST, R.A.M.C.

On a new sub-species of Bulbul obtained by the author at Basra.

SUPPLEMENTARY NOTES ON INDIAN BIRDS BY B. B. OSMASTON C.I.E., I F.S.

The article is written on special reference to certain errors and omissions in the Volumes on Birds in the Fauna of British India series.

DESCRIPTION OF A NEW SNAKE OF THE GENUS *CONTIA* (B. AND G.) FROM PERSIA BY G. A. BOULENGER, F.R.S.

ON A COLLECTION OF SNAKES MADE IN THE NILGIRI HILLS AND THE ADJACENT WYNAAD. PART 1 AND 2. BY COL. F. WALL, I.M.S., C.M.G.

Col. Wall's paper is based on a collection of 1699 snakes comprising 43 different species, one of which is new to science.

NOTES ON INDIAN BUTTERFLIES, BY LT.-COL. W. H. EVANS, R.E., F.E.S.

These articles are written with a view to bringing up to date our information on Indian Butterflies and are continued from the previous Volume.



INDIAN DRAGONFLIES—PARTS III, IV, V AND VI. BY MAJOR F.C. FRASER.  
I.M.S.

The papers are intended primarily to give a brief outline of the Anatomy and Biology of Indian Dragonflies and subsequently a description of the various families, genera and forms found within Indian limits.

THE CYPERACEAE OF THE BOMBAY PRESIDENCY—PART II. BY L. J. SEDGWICK, I.C.S.

The papers provide a more up to date flora of this family (Rushes) adding 20 new species to the number given by T. Cooke in his work on the Flora of the Bombay Presidency.

A REVISION OF THE INDIAN SPECIES OF ROTALA AND AMMANIA. BY E. BLATTER AND PROF. HALLBERG—PART II.

The articles are published with a view to correcting the many mistakes as to identification, description and synonymy which have crept into the more recent works on Indian Botany and amplify the number and description of species as contained in the papers by Clarke on Indian *Lytharacea* in Hooker's Flora of British India (Vol. II, 1879).

SOME SOUTH INDIAN COCCIDS OF ECONOMIC IMPORTANCE, BY T. V. RAMAKRISHNA AYAR, B.A., F.E.S., F.Z.S. GOVERNMENT ENTOMOLOGIST, MADRAS.

Describes 33 species of Coccids inhabiting S. India, with special reference to these as Garden and Orchard pests.

EXPECTED PLAGUE OF FIELD RATS IN 1920 BY L. J. SEDGWICK, I.C.S., WITH A NOTE BY MR. N. B. KINNEAR.

Written in special reference to the recrudescence of plague of Field Rats in years immediately following periods of famine with a note by Mr. N. B. Kinnear containing suggestions and recommendations in regard to the above.

Articles of popular interest have been contributed by Mr. E.C. Stuart Baker, in his serial on the Game Birds of India. Mr. T. R. Bell in his articles on the Common Butterflies of India, and Lt.-Col. F. Wall, whose work on Common Indian Snakes is concluded in the present Volume. In addition to the above a number of interesting articles and notes on the Indian Fauna and Flora are published. These articles are a contribution to the Society's principal object, which is the spread of knowledge and the awakening of popular interest in Nature study in this country.

### EDUCATIONAL.

The past eighteen months have been of considerable importance as marking a definite stage in the career of the Society. Hitherto the Society had existed for the benefit of members and the spread of knowledge in regard to the Natural History of India amongst those interested. During the period reported on, the Society has extended its scope of work so as to include that of interesting the unlearned in the Natural History of India and indicating means by which a knowledge of Natural History can be of practical value to every one in the vast Empire of India.

Medical research has secured to us a sure remedy against death from the bite of a Cobra or a Russell's Viper. Statistics however tell us how often people in this country die from the bite of a non-poisonous snake through fright alone. The provision of easy, yet accurate, methods of identification between the poisonous and non-poisonous snakes of India has therefore for a long time been a great desideratum. The Society provided this so far as the medical profession and scientifically trained people were concerned when they published in 1907 Lt.-Col. Wall's "Treatise on Poisonous Terrestrial Snakes of the Indian Empire." New editions of this work were published in 1913 and 1917. In 1919 Lt. Hayes suggested that Col. Wall's book might be simplified so as to enable a key distinguishing between the poisonous and non-poisonous snakes of India to be published in Chart form. His idea was elaborated by Mr. S. H. Prater of the Society's Museum and approved by Col. Wall.

The chart is being printed in England and, by the means of simple diagrams and letterpress, enables individuals with no previous experience of the subject to recognise the poisonous snakes found in India. It has been adopted for the use of Hospitals, Dispensaries and Schools by the Bombay Government and most of the Provincial Governments in India. It is proposed to print the charts in the various vernaculars to meet the needs of the primary schools in the different provinces.

The introduction of charts descriptive of the indigenous Fauna and Flora which will help Indian students to obtain a more intimate knowledge of wild life in India would be a decided advantage. Nature study as hitherto taught in Schools in India deals for the most part with animals and plants not found in this country. This is partly due to the want of suitable literature on the subject, and to remedy this defect the Committee is considering the publication of a series of illustrated charts with short descriptions on :—

Common Indian Birds.

Common Indian Animals.

Common Indian Butterflies.

Common and Useful Indian Plants.

Further steps in this connection are the giving of lectures on Natural History subjects to various schools, these lectures to be illustrated where possible with lantern slides. The Committee of the Society is prepared to render all possible assistance in this connection and they are glad to report that one of their number, Col. Glen Liston, C.I.E., I.M.S., has already been giving lectures on popular and useful Natural History subjects to Teachers in High Schools in Bombay with a view to helping them when teaching nature study to their pupils.

With a view to still further co-operating with the Educational Departments connected with the Local and Provincial Governments in India the Society proposes to prepare educational charts for the use of schools, the Health Department of Municipalities and other Institutions as well as the general public. These charts will convey information on subjects which intimately concern the health and well-being of residents in India. With this object the Society is arranging descriptive charts on the following subjects :—

The House Fly as a danger to health.

Mosquitoes—in connection with Malaria.

The Louse—and its relation to Disease.

The Bed-bug and how to deal with it.

House Rats as enemies of mankind.

These charts will contain diagrams and simple descriptions together with recommendations for the preventive measures to be adopted against these pests.

#### FORTHCOMING PUBLICATIONS BY THE SOCIETY.

INDIAN DUCKS AND THEIR ALLIES, BY E. C. STUART BAKER, F.Z.S., M.B. O.U. 2ND EDITION, REVISED AND ENLARGED, WITH 31 COLOURED PLATES, BEING VOL. I OF THE GAME BIRDS OF INDIA.

The first edition reprinted from the Journal of the Bombay Natural History Society and published in 1908 was sold out within a short period. To meet the widespread demand for a work which appeals both to the Sportsman and Naturalist, the Society have decided to bring out a second edition. The letterpress has been revised and brought up to date and an additional plate illustrating the various species of swans occurring in India is included in the present issue.

THE GAME BIRDS OF INDIA (SNIPE, BUSTARD, SANDGROUSE). VOL. II., BY E. C. STUART BAKER, F.Z.S., M.B.O.U.

Reprinted from the Bombay Natural History Society's Journal with 14 coloured Plates by H. Gronvold and other illustrations. The Series will be completed in four volumes. Vol. III containing the Pheasants and Vol. IV the Partridges.

Natural  
study in  
schools.

Lectures.

Educational  
charts.



**PALMS OF BRITISH INDIA AND CEYLON.** BY REVD. E. BLATTER, S.J., F.L.S.

Reprinted from the Bombay Natural History Society's Journal and profusely illustrated with over a hundred photographs and a large number of text blocks. The Volume deals with the Palms of India, Burma and Ceylon, both indigenous and introduced and contains interesting accounts of History, Uses, and legends attached to this interesting order in a manner that would appeal both to the botanist and the general reader.

**HAND LIST OF BIRDS OF THE INDIAN EMPIRE.** By E. C. Stuart Baker, F.Z.S.

**HAND LIST OF SNAKES OF THE INDIAN EMPIRE.** By Col. F. Wall, C.M.G., I.M.S.

**FAUNA OF MESOPOTAMIA.** A series of articles on Mammals, Birds, Reptiles and Fishes of Mesopotamia by various authors.

#### PAST PUBLICATIONS BY THE SOCIETY.

The following are still available :—

**THE POISONOUS TERRESTRIAL SNAKES OF THE BRITISH INDIA.** Price Rs. 2 to Members and Rs. 3 to non-members.

**LIST OF INDIAN BUTTERFLIES.** Price Rs. 2.

**WOOD DESTROYING WHITE ANTS OF THE BOMBAY PRESIDENCY.** Price Re. 1.

**CATALOGUE OF THE SOCIETY'S LIBRARY.** Price Rs. 2.

**THE FLORA AND FAUNA OF MATHERAN AND MAHABLESHWAR.** Price Re. 1.

**THE SOCIETY'S JOURNAL** from No. 1 published in 1886 to date. Back-numbers and occasionally complete sets are obtainable from the Secretary to whom application should be made.

#### THE SOCIETY'S JOURNAL.

Future numbers will contain the following :—

Papers on Game Birds of India, Burma & Ceylon. By E. C. Stuart Baker—  
(continued).

„ Common Butterflies of the Plains of India. By T. R. Bell.—  
(continued).

„ Flora of the India Desert. By Rev. E. Blatter, S. J., & Prof. Hallberg—(continued).

„ Indian Dragon Flies. By Major F. M. Fraser, M.D., I.M.S.—  
(continued).

#### WANT OF MUSEUM ACCOMMODATION.

The want of space in the Society's Rooms renders it difficult for the Society's Museum to take even to a limited extent the part so splendidly played in the cause of education by the National Museum at Home. The Committee would draw attention here to the proposals agreed to by the members of the Society and placed before the Trustees of the Prince of Wales' Museum of Western India whereby, without in any way sacrificing the individuality of the Society and its work in Scientific research, the collections of the Society would be housed in a public museum and arranged so that the full educational value of the collections would be available to the general public and to students in particular. It is greatly to be regretted that such slow progress is being made with the carrying out of the scheme.

#### CONCLUSION.

The Committee cannot close this report without expressing their deep sense of the obligation the Society owes to Mr. W. S. Millard who resigned this year his positions as Honorary Secretary and Editor. Mr. Millard had been connected with the Society since 1888 and to him and Mr. Phipson the enlargement of the scope of the Society's work is largely due. The Committee have also to report with great regret the resignation of Mr. N. B. Kinnear who had been in charge of the Society's collections since 1907 and one of the Editors of the Society's Journal and who also acted as Joint Honorary Secretary during Mr. Millard's absence.

R. A. SPENCE,

Honorary Secretary.



## EDITORIAL.

IN the preceding pages of this number there appears a report of the work of this Society since the Armistice. The report was originally written with the idea that Government and other Natural History Societies and Institutions should know what this Society had been doing, was doing, and intended to do, but subsequently recognising that it was first and foremost necessary that the members of the Society should be kept thoroughly acquainted with the work of the Society, which they maintain through their subscriptions, the Committee decided to publish the report in the Journal. It will, we hope, prove of interest.

Before this Journal is issued members will all have been made aware of the proposals to transfer part of the Museum of this Society from its old quarters in Apollo Street to the premises of the Prince of Wales' Museum in Bombay. Until the original idea of building a Natural History wing to the existing Prince of Wales Museum building is carried into effect—and for want of money it is unlikely that this will be effected for several years—the offices and work of the Society will be carried on in the old premises. The change will not affect the interests of members in any way, nor the personal relation which has for so long existed between the upcountry members and the Committee in Bombay. What the change will bring about, it is hoped, is that the collections to which members have contributed in the past, and which we believe members will contribute to in the future, will be better looked after than it is now possible to look after them in our crowded quarters. With better Museum accommodation we should be able to be of more assistance to members who wish to work out their own collections, or have them worked out for them, and we shall be able to let others have some benefit from the interesting exhibits which have been received from our members during the course of nearly forty years. Naturalists are the least selfish of men and it must have been a source of regret to many that the valuable collections this Society possesses have, for reasons outside its own control, been inaccessible to the general public, and for the matter of that to the general run of members.

Before touching on the work of the Society's Mammal Survey during the past few months, the Editors have been asked by the Committee to express their thanks, and the thanks of all the members of the Society, to General His Excellency Maharaja Sir Chandra Shumshere Jung Bahadur Rana, G.C.B., G.C.S.I., G.C.M.G., etc., Prime Minister of Nepal, for his kindness in allowing one of our trained Indian collectors to work in Nepal. Owing to this permission we have been able to send a qualified skinner, who was trained in Natural History work by Mr. Kinnear, to work under Col. R. L. Kennion in Nepal. It is a piece of good fortune which we had long hoped for but had not dared to ask for until we were able to do so through the instrumentality of Col. Kennion, whose interest in Natural History is so well known. Since Brian Hodgson collected in Nepal from 1830 to 1845 the country has been practically unworked, para-types of his original type specimens are badly wanted by the British Museum and other Museums, and the results of His Highness' permission should be most valuable.

Mr. Wells is still carrying on the work of the Survey in Assam and we are very grateful to Mr. A. J. W. Milroy, one of our members, who has afforded Mr. Wells the opportunity of accompanying him on a journey into the Cachar Hills, where, with Mr. Milroy's assistance, it is hoped he will be able to do some very useful collecting in country which without the personal assistance of officials it would be practically impossible for him to travel in.

The statement has, we believe, been made that the work of the Society's Mammal Survey supplants and undertakes work which has so far been done

and would be done by amateurs as a relaxation from their ordinary duties. Far from doing this however the Society's Mammal Survey assists, and will assist, the amateur naturalist, and we think those who had the pleasure of meeting Capt. G. C. Shortridge in the course of his work for the Society will bear this out. At present Mr. Wells is learning and depends for help on our members, and our collectors must always depend for help on these, but the results of the Survey give members information of great value as to the animals found in various districts, and help by pointing out problems on which more information is wanted. The survey is intended to guide the amateur worker into channels where his co-operation will have the best effect.

The Society invites the assistance of its members, especially of those who have the opportunities at their disposal for studying and making collections of animal life in localities which are not readily accessible, to co-operate in making the Mammal Survey an outstanding success. In his introduction to the "Summary of the Results of the Mammal Survey," Mr. Wroughton points out the direction in which help can best be given, and he suggests that what are required are a series of skins from the fauna which surrounds the collector and that a series of skins of a single species of mammals, from a given locality, is very much more valuable than single specimens. The Society will always be ready to help members who are willing to assist in the work with advice on methods of collecting, etc. It would further be prepared to loan the services of a trained skinner in cases where members are in a position to make full use of his services. It is not only in the department of mammals that the assistance of members is sought, the same may be said of birds, fishes, reptiles and mollusca.

Science is greatly indebted to the work of amateurs, and their services in its cause are commented upon by Prof. T. A. D. Cockerell in his article on English Naturalists in 'Natural History' the Journal of the American Museum of Natural History. "Men who spent their leisure moments in the study of plants, insects, birds, or fossils, forming Societies and organizing excursions, everywhere worshipping at the shrine of Nature and gathering data for the advancement of knowledge." He avers that love for Nature was inculcated in these men by the excellent sources for information available to the youthful naturalist in England. "There were elementary 'Natural Histories' suited even for children, with good coloured illustrations. For those a little older, shilling books furnished guides to the butterflies, beetles, common objects of the country side, common objects of the sea shore. In addition to which the facilities afforded by local museums with the collections of the local fossils, insects and other objects made the would-be naturalist independent of formal instruction and enabled him to puzzle out things for himself."

A comparison of these conditions with the deplorable state of affairs prevailing in this country will in some measure account for the prevailing apathy among Indians in general for work of this nature. There are a few brilliant exceptions, but, alas, remarkably few.

The course of Nature Study prescribed in Indian Schools is retarded by the want of suitable literature describing the fauna and flora of the country in which the pupils live. As a general rule the books and explanatory charts at the service of the teacher deal with animal and plant life not met with in this country.

The report of the working of the Society for the past period makes reference to the future policy of the Society as regards its co-operation with the teaching body in this country by the publication of charts dealing with animals and plants commonly met with in India. Their introduction into Indian schools would tend to rouse the interest of the Indian pupil in the natural life which surrounds him and should develop in him a desire for further study and research.



There is a great dearth of readable books on Indian Natural History subjects, the standard works so far published are admirable in themselves but presuppose a knowledge of the subject on the part of the reader and as such are unsuited to the majority of the public.

In making a plea for Scientific Literature such as could be read and assimilated by the ordinary layman we would quote the words of the late President Roosevelt who was, among many other things, an ardent naturalist: "Very few scientists have written interestingly and these few have usually felt apologetic about it. Yet sooner or later the time will come when the mighty sweep of modern scientific discovery will be placed by scientific men with the gift of expression at the service of intelligent and cultivated laymen. Indeed I believe that already science has owed more than it suspects to the unconscious literary power of some of its representatives, for instance in regard to evolution .....where their predecessors have created hardly a ripe Darwin and Huxley succeeded in effecting a complete revolution in the thought of the age. I believe that the chief explanation of the difference was very simple in that Darwin wrote what was interesting to read."

It is not too much to hope that Roosevelt's prophecy will be fulfilled and that the time will come when the scientist will write not alone for his brother scientist but also for the wider brotherhood of his fellowmen. This hope has already been fulfilled not only in this Journal but in others and in this connection we would invite attention to the very interesting article on Some Parasitic Flies written by Harold Russell in the July number of the Quarterly Review. We hope to induce Mr. Harold Russell to write on the subject of Indian Parasitic Flies in this Journal.

The Society receives from time to time not only the Journals of learned Societies, but also Government publications of various kinds and from various countries. From the supplement to THE FEDERATED MALAY STATE GOVERNMENT GAZETTE we extract the following:—

*Zoological Expeditions.* The expenditure on Museums during the year amounted to \$35,483. Expeditions for zoological purposes were made to Peninsular Siam, to the Endau and Rumpin Rivers in Pahang, to the "One Fathom Bank" off the Selangor coast, to Pulau Jarak in the Straits of Malacca, and to Sarawak. The expedition to Peninsular Siam was one of considerable importance, and produced large results, several new species being comprised in the collections, while the expedition to Sarawak resulted in the addition of some 1,600 specimens of vertebrates, many of which are of great rarity.

*Botanical Work.* A very extensive Botanical collection from lower Siam was forwarded during the year to the Royal Botanical Gardens at Kew, but little other work was done in this branch, partly owing to the pre-occupation of the staff with zoological work, and partly to the enormously increased cost of paper, of which large quantities are required for botanical work.

*Public Health.* The work done by the Malaria Bureau was severely handicapped by the sickness which is the unavoidable concomitant of such work, but much valuable information was collected. The great amount of field work done, in spite of sickness and shortage of staff, is indicated by the following figures:—

Breeding places found and examined .. .. .	1,365
Larvæ identified microscopically .. .. .	20,506
Adults bred out and identified .. .. .	4,802

Much increased interest in the work of the Bureau has been shown by outside workers and others.

An interesting and somewhat disturbing question raised in the course of the field work during the last two years is as to whether there is not a danger of domesticating the Anopholine as a result of anti-malarial clearing and drainage work as at present carried on. During the whole of 1913 Anopholines were



only found eight times in artificial breeding places such as disused tins, broken jars, etc., and the surroundings in which the eight cases occurred suggested the idea that it was the destruction of neighbouring natural breeding grounds which had driven the insects to artificial breeding places commonly found close to human dwellings. Much more information must be collected before it can be decided whether this idea represents a real danger or is a mere chimera.

Turning from the publication of others to those of our own Society we are glad to record the completion of arrangements for the publication of the first volume of Game Birds, which is the second edition of Indian Ducks, and of the second volume of Game Birds which comprises the Snipe, Bustard and Sand Grouse, and also of the Snake Chart. Full particulars of these have been issued to all members and the subscription list opened to members has been well filled. Unfortunately owing to increased prices at home and the fall in exchange the estimated cost of production will be considerably exceeded. Difficulties at home have delayed publication but owing to Mr. Millard's energy these will be overcome. His labours have not been lightened by a continual stream of instructions from Bombay. One of the last of these was considered a very valuable one—so much so that it was sent by cable. It consisted of advice received from a medical member of the Society who had experienced much trouble from the destructive agency of rats and white ants and his advice was that the linen, varnish and roller of the Snake Chart should be preserved by poison against the voracious appetite of these pests. Despite Mr. Lefroy's help this has proved too much for the English publisher and the idea has had to be abandoned.

A good many enquiries have been received for vernacular editions of the Snake Chart and arrangements are being made for these to be printed and issued on the Society's behalf by the Oxford University Press. It is hoped that this Press will be able to collaborate with the Society in the issue of Nature Science Charts for schools in India.

The Committee have to record with great regret the death, the result of an accident, of Mr. E. L. Sale, I.C.S., who was Honorary Treasurer of the Society in 1912 and was always keenly interested in its welfare. He will be greatly missed by a wide circle of friends.

It is also with great regret that they have to report the death of Mr. F. M. Howlett of the Agricultural Research Institute, Pusa. Mr. Howlett had been a member of this Society since 1908.

Mr. F. Ludlow of the Indian Educational Service has been elected to the Committee to fill a previously existing vacancy.

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## MISCELLANEOUS NOTES.

## No. I.—TIGERS IN TREES.

There is a considerable literature on the subject of tigers climbing trees to be found in old Sporting Magazines, although I can discover in our Journal only one reference to such an occurrence, recorded by Mr. Monteath in Volume XXVI, No. 3. Such being the case and the magazines in question being very difficult to obtain, it is perhaps worth collecting all that can be found on the subject.

In the *Bengal Sporting Magazine* for 1834 it is recorded that a tiger, struck on the back of the head by a bullet on the previous evening, was found quite dead on the lower branch of a pipal tree at least fifteen feet from the ground. The marks of his claws on the bark were so clear that there could be no difficulty in deciding that he had scrambled up cat-fashion. He then ran along the branch, at the extremity of which he lay down across it, his legs on either side being kept in balance by small twigs, there he died. This animal had not attained his full growth. An instance is given in the *Bengal Quarterly Sporting Review* for 1843 of a hunted tigress mounting to a bough twenty and a half feet from the ground to seize a man, the man was wounded and the tigress then lost her balance and fell.

In 1856 "Teutonium" recorded two such instances in the *India Sporting Review*. In the first case he had news of a tiger sitting in a tree where it was said to be blockaded by villagers. He rode to the place, which was within five hundred yards of a village, and there saw a large pipal tree round which people were picketed. A spearman was standing almost underneath it. When he approached within a hundred yards of the tree "there appeared, standing on a sturdy branch high aloft in the tree, the tiger, erect and calm and fearless with black, yellow and white colours in stripes, looking beautiful in high relief". The height of the animal above the ground was found to be twenty-five feet when subsequently measured. On receiving a shot he caught a lower branch with his two arms in falling, hung for a minute and then dropped dead. The villagers had found the animal in the morning asleep under a mango tree. On being roused he at first tried to hide himself in the drain of a tank, and eventually mounted the tree, which from its size and low stout branches was easy of ascent. They said that once during the day he tried to descend, but that he was driven higher up by their shouts. This was a young tiger about eight feet in length.

The second case, which was very similar, occurred on the 17th May 1856 near the village of Tucheza. A tiger attacked a buffalo near the village at about daybreak, but was driven off by the herdboys. The villagers then turned out and the tiger got up a pipal tree, where a dozen villagers remained to prevent it getting down. The sportsman, approached to within forty yards, mounted on an elephant, and related that as he stood up in the howdah with his rifle levelled at the tiger's chest, it appeared to be a few feet higher than the rifle, and he calculated it to be about nineteen feet. The tiger, which was killed with three shots, proved to be a male measuring nine feet eleven inches. "How he got up the tree I could not well make out, as with the exception of an intervening branch, and many large notches, the trunk, measuring in circumference at least 38 feet, was at least fourteen feet high, and then branched out like a banyan tree, and there was plenty of room where he could stand and lie."

In Volume I, No. 5, of the *Oriental Sporting Magazine* for 1866, it is related that a herd of buffaloes drove a wounded tiger into a rhododendron tree, but no other particulars are given. In Volume IV, No. 41, of the same magazine



for 1871, an instance is given of a tigress charging a man in a tree, and springing up eleven feet six inches from the ground, as proved by the claw marks. It is also said that she began tearing the bark off the tree with her teeth at ten feet four inches from the ground.

Mrs. Colin Mackenzie in her book "Life in the Mission Camp and Zenana," says:—"Captain J. told me he never knew a tiger up a tree but once; that was at Hingoli. An unfortunate man who thought himself quite safe cried out 'here she comes'! The tigress heard him, went up the tree, pulled the man down, and bit him on the knee so severely that he died in hospital soon after. It was so remarkable an occurrence that the tree was cut down and brought into Hingoli as a curiosity."

But the most remarkable instance of tigers climbing trees was recorded in the *South of India Observer* in December 1870, as follows:—

"More tigers! Now that our monsoon is over, or greatly moderated, our sportsmen have been able to resume operations against the feline race. We learn that two gentlemen killed two tigresses last week, one on the 2nd instant, the other on the 5th. They may be called the Peermund and Aniculmund tigers. Both afforded considerable sport, and one carried on such games as possibly never were heard of before in tiger shikar. It appears that the one alluded to was found in a small sholah, about 200 yards long and 50 or 60 broad. The coolies and dogs had scarcely been put in at the top of the beat when a sudden screaming and skedaddling among our canine friends was heard, which showed that there was some animal of dangerous proclivities inside. This had hardly passed when a huge tigress bounced out at the foot of the sholah, immediately going heels over head in a hidden nullah which she had not seen. This was all so instantaneous that there was barely time for one of our sportsmen, who was seated calmly on the grass within 25 yards of where this happened, to blaze a shot at the tigress as she flashed back into the sholah. The men continued beating down and presently stripes again showed for a moment at almost the same place, and another hasty shot was fired. She then disappeared for some time, and next showed herself near the top of the sholah and tried to escape in another direction, but the coolies made such a din that they drove her down again. Now comes the curious part of the story. One of the shikaries, watching at the top, spied Mrs. Stripes suddenly appear on the top branches of one of the highest trees in the sholah. He immediately called out, "the tiger has gone up a tree."

This was good news, and one of the sportsmen ran up the side of the sholah and sure enough saw Mrs. Stripes laid out on a branch at least thirty feet from the ground. To knock her off this perch with a brace of bullets took but a moment of time, and down she came with a thundering crash, apparently lifeless. The beaters began to cheer, thinking their work was over; but they say a cat has nine lives and so it proved on this occasion. She presently began growling and snarling at the dogs that had got round her. The gentleman who had been busy with her, as she was nearest his side then crawled into the sholah and presently saw Mrs. Stripes get on her legs and move off; but the brushwood was so thick that it was impossible to see in what direction she was coming, so he skedaddled. He had hardly got out, when to his amazement he saw stripes shining up the same tree, just as any ordinary house-cat would. The tigress got back to almost the same part of the tree as before and stood on the fork of two branches upright, looking down and exposing her great chest. To tumble her off again was a momentary affair, and down she came with a tremendous crash. She required a ball through her brain to finish her off, even after this, as she lay on the ground pawing at the dogs. The sportsmen examined the tree after the battle was over, and it proved to be perpendicular for about 25 feet. There were the claw-marks, showing that she had gone up the same tree twice, once wounded, as seen by the blood. The



claw-marks were mere scratches, and how this great animal could climb a perpendicular tree is a perfect marvel. Everyone has seen a house-cat run up a post or tree, and this huge tigress did this with just as much ease. From this experience we might suppose that tigers drop on their prey from branches, and also reconnoitre their game from high trees. To show what a difficult tree this was to climb two young active coolies were offered a rupee each, if they would climb the tree, and they failed to do so."

In a letter to the *South of India Observer*, Lieutenant-Colonel Christie confirmed the story, and wrote that he shot the tiger in the way described. He added that the tree was perpendicular, about a foot in diameter, with no branches for about 25 feet. He wrote that "the tree in question will doubtless retain the double set of claw-marks for years to come, so any curious or dubious gentleman may go and look at it near Peermund. The length of the tigress was about 9 feet 6 inches."

The other sportsman present was Mr. J. W. Hadow of Southwich House, Ootacamund.

CHARLTON KINGS, ENGLAND,

June 1920.

R. G. BURTON, BRIG.-GENL.

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## No. II.—MAN-EATING TIGERS ON SAUGUR ISLAND IN THE 18TH CENTURY.

It is not often that Europeans have fallen victims to man-eating tigers but I find recorded in the *Annual Register* two instances of such occurrences on Saugur Island. The following extract of a letter from a gentleman to his friend at Calcutta is printed in the *Register* for 1793 and dated the 23rd December 1792 on board the ship "Ardasier Shaw," off Saugur Island :—

"To describe the awful and lamentable accidents I have been an eyewitness of is impossible. Yesterday morning Mr. Downey, of the Company's troops, Lieut. Pyefinch, Mr. Monro (son of Sir Hector), and myself went on shore on Saugur Island to shoot deer. We saw innumerable tracks of tigers and deer but still we were induced to pursue our sport, and did the whole day. About half past three we sat down on the edge of a jungle to eat some cold meat sent us from the ship, and had just commenced our meal when Mr. Pyefinch and a black servant told us there was a fine deer within six yards of us. Mr. Downey and myself immediately jumped up to take our guns; mine was the nearest, and I had just laid hold of it when I heard a roar like thunder, and saw an immense royal tiger spring on the unfortunate Monro, who was sitting down. In a moment his head was in the beast's mouth, and he rushed into the jungle with him with as much ease as I could lift a kitten, tearing him through the thickest hedges and trees, everything yielding to his monstrous force. The agonies of horror, regret and fear rushed on me at once. The only effort I could make was to fire at him, though the poor youth was still in his mouth. I fired a musket, saw the tiger stagger and agitated, and cried out so immediately, Mr. Downey then fired two shots, and I one more; we retired from the jungle, and a few minutes after Mr. Monro came up to us all over blood, and fell. We took him on our backs to the boat, and got every medical assistance for him from the "Valentine" East Indiaman, which lay at anchor near the island but in vain. He lived twenty-four hours after, but in the extreme of torture; his head and skull were torn and broken to pieces, and he was wounded by the claws all over the neck and shoulders; but it was better to take him away, though irrecoverable, than to leave him to be devoured limb by limb. We have read the funeral service over him and committed him to the deep. He was an

amiable and promising youth. I must observe there was a large fire blazing close to us, composed of ten or a dozen whole trees; I made it myself on purpose to keep tigers off, as I had always heard it would. There were eight or ten of the natives about us, and many shots had been fired at the place and much noise and laughing at the time, but this ferocious animal disregarded all. The human mind cannot form an idea of the scene; it turned my very soul within me. The beast was about four and a half feet high and nine long. His head appeared as large as an ox's, his eyes darting fire, and his roar, when he first seized his prey, will never be out of my recollection. We had scarcely pushed our boats from the shore, when a tigress made her appearance, almost raging mad, and remained on the sand as long as the distance would allow me to see her."

The following is an extract from the *Annual Register* for 1787, Calcutta, October 12th:—The following melancholy accident shows that a tiger is not always deterred from approaching fire. A small vessel from Ganjam to this port, being longer on her passage than was expected, ran out of provisions and water. Being near the Saugur Island, the Europeans, six in number, went on shore in search of refreshments, there being some cocoanuts on the island, in search of which they strayed a considerable way inland. Night coming on and the vessel being at a distance, it was thought more safe to take up their night's lodging in the ruins of an old pagoda, than to return to the vessel. A large fire was lighted, and an agreement made that two of the number should keep watch by turns, to alarm the rest in case of danger, which they had reason to apprehend from the wild appearance of the place. It happened to fall to the lot of one Dawson, late a silversmith and engraver in this town, to be one of the watch. In the night a tiger darted over the fire upon this unfortunate young man, and in springing off with him, struck its head against the side of the pagoda, which made it and its prey rebound upon the fire, on which they rolled over one another once or twice before he was carried off. In the morning the thigh bones and legs of the unfortunate victim were found at some distance; the former stripped of its flesh and the latter shockingly mangled.

CHARLTON KINGS, ENGLAND,

June 1920.

R. G. BURTON, BRIG.-GENL.

### No. III.—A SPORTING DIARY.

The Society is indebted to His Highness the Maharaja of Bikanir for permission to publish the following extracts from His Highness's Sporting Diary. The extracts deal with a sporting trip His Highness made in Nepaul between March and April 1920. On the 17th March the first camp was made at a village called Babia and on the 20th His Highness shot his first Wild Buffalo. Writing from Babia on the 17th he says:—

"Saw at Hathi Manda village, half an hour's journey from Babia, a tame male buffalo, which, while tied to a tree in the village, was set on and badly gored by a Wild Buffalo (Arna) who lives in the jungle close by and spends most of the night till fairly late in the mornings with the tame she-buffaloes of the village in the open patch close by the village."

On the following day an unsuccessful attempt was made to bring the beast to bay, in regard to which His Highness writes:—

"Unfortunately a mess was made owing to overkeenness. Bearing in mind the late Maharaja of Cooch Behar telling me how Wild Buffalo, living with village buffaloes, were sometimes easily shot off elephant, I thought same would result to-day. But the buff was on the other side of the plain from where we entered it—two howdah elephants only, self and Hiru. As



soon as he saw us he began to move away and entered the jungle, never letting us get nearer than some three hundred yards and I did not want to disturb him further with a long shot of which I could not make certain."

The buffalo returned to his nocturnal haunts the next evening but was left undisturbed. The following day, the 20th, His Highness describes as a red-letter day, his diary for the period runs as follows:—



At last I have shot my first buffalo. Khuber came of Buffalo at 7 a.m. Left camp about 7-30. Got to place about 8-45 a.m. A machan was tied up just a little inside the plain beyond the jungle on a small tree on which Hiru and I, with Asu Singh loading for me, got up. Staff put up on two machans to our right front and right rear in case of buffalo escaping wounded. Saw Arna buffalo a little to the north of where we saw him on the 18th. The only way to get a decent shot, as he wouldn't allow elephants near him, was to try some subterfuge. Hence machans and our attempting to get him to follow the tame buffalo herd past our tree. The plan succeeded and he followed some twenty yards behind the village buffaloes passing my machan about 70 yards off. Although the shooting itself was comparatively tame work, I confess I felt quite excited when the wild bull-buffalo began moving towards us! Would he come on, or, seeing us, move away without giving us a shot? But all went well and my rifle spoke out three times, the first bullet from my .465 Cordite going home well and true, crashing into his right shoulder, and the mighty beast came down on his knees and head. The second bullet again got him in the shoulder while he was plunging about on the same spot (though mortally wounded) and down he went. But as he was still moving about a little I finished him off with a third bullet in the top of the neck with the .450 Cordite. On cutting up his head we found that the old buff had a 12 bore bullet buried just below the skin in the neck, and we ascertained that a Nepalese officer had tried to shoot it last year as it was giving much trouble to the villagers. This accounts for his not letting the elephants approach him.



He also had marks in neck and hindquarters of encounters with tigers, evidently before he was full grown. A great trophy though not with as long horns as I hoped for. Measurement of Buffalo as below :—

Total length from nose to tip of tail	..	..	13 ft. 00 in.
Body	..	..	9 ft. 10½ in.
Tail	..	..	3 ft. 1½ in.
Height	..	..	5 ft. 2¼ in.
Length of horn on outside curve	..	..	45 in.
Circumference	..	..	19½ in.
Tip to Tip	..	..	47 in.
Widest inside	..	..	46 in.
Widest outside	..	..	50¼ in.
Across skull excluding horns	..	..	19½ in.
Both horns across skull round outside curve	..	..	8 ft. 4¼ in.

The record horn taking the length of horn on the outside curve is according to Rowland Ward (latest edition) 77¾".

The largest head in the Society's collection has horns measuring 54½" and 54" and is 125" on the outside sweep.

The association of Wild Bull Buffaloes with domestic herds has often been commented on by sportsmen.

On the same day the party moved off to Bankulwa where the following morning khuber of tiger was received from no less than 5 places. His Highness writes :—

"Two tigers ringed in but one got out before I got there. First sight I had was of a big tiger in mid air above grass jumping, I should say a good 9 feet from the ground, at the head of a huge tusker, Shamsheer Prasad, which he scratched in forehead. Shortly on my moving our elephant round, he charged out straight at Hiru and me but my elephant moved backward some three yards and I had very unsteady and unsatisfactory first two shots. Hiru fired after I had wounded him and knocked him over temporarily, and the tiger went a little further riddled with my bullets and Hiru's shot, and died. Fine 10 ft. 1 in. tiger—the longest body tiger (7 ft.)—that I have shot or seen shot. Searched and made two rings for the second tiger but in vain. My elephant when making second ring nearly threw me out of howdah by kneeling and attempting to tusk a hogdeer breaking past him."

The 22nd brought no further addition to the Game record beyond 2 Mugs shot in a stream running by the Camp.

"The first one on being cut open had thirty-six eggs and a small tortoise inside it and the second one forty-five eggs and sixteen small round stones!"

On the 23rd His Highness had the good fortune to bag another 10 ft. 1 in. tiger. The animal had a huge head 3 ft. 1 in. and stood 3 ft. 5¼ inches in height. "The second biggest measurement in my Game log, my last tiger in Nepal shot on the 20th May 1918, standing 3 ft. 8 inches in height."

In describing the shooting of this tiger His Highness writes :—

"He looked an awfully fine sight galloping, head and tail raised, through the grass in the dusk."

On the 24th the shooting camp was shifted to a place called Hindalwa, where on Wednesday, the 31st March, the Maharaja shot what is described as the record tigress. His Highness describes the incident as follows :—

"Another red-letter day. Four tigers reported for some days right beyond the Kosi. They however before daylight went up a long low hill just above. So sent elephants out at night and put a line between the grass and the hill early this morning. Khuber brought here at 8 a.m. of one big tiger and two others seen, though a fourth was also expected to



His Highness the Maharaja of Bikanir's 9 ft. 7 in. Tigress.





be there. Left camp at 9-15 a.m. Motored in half an hour to Kosi bank on this side, crossed in a boat comfortably, went across a strip of jungle about half a mile wide, and again crossed in boat the other branch of Kosi on other side and got into howdahs at 11-15 a.m. We stood on bank of dry nullah bed some 100 yards wide, and sent two elephants across to first patch of grass, where big tiger was reported. It was lying there in rather low grass. A magnificent sight followed. A huge tiger, looking bigger even than it was owing to its standing out well above the low grass, immediately showed up and after going on the far side ahead of the farther elephant suddenly turned round and with tail up, charged out at elephant, then turned round and came through the grass straight at us. I attempted to down it with Mannlicher as it was leaving grass to cross nullah but elephant moved and my bullet failed to stop or drop it, the same happened with the second shot from the Mannlicher, and then I took up the .240 double barrel and my first shot hit it in the shoulder rather low. But except for a quiver she came on charging right across the nullah and, just when things looked exciting, suddenly fell dead at our feet, when almost up the bank. We all voted it to be a fine male tiger—the father of the family. Imagine our surprise on going up to it to find it was a huge tigress, of which the smallness of the head as it lay dead gave me my first doubts. On eyeing it closely it turned out to be the Record Tigress ever shot and the biggest recorded in India—9 ft. 7 inches long, with a body 6 ft. 5 inches, and a really superb prize to have secured. The record from Rowland Ward's book till now was 9 ft. 5½ inches, by Lord Villiers, though my 9 ft. 5 in. Lachhamania Tapu tigress shot in 1918 in Nepal had a 6 ft. 3 inches, against the body of Lord Villiers' tigress of only 6 ft. 2½ in."

"The following are the detailed measurements of the Record Tigress:—

Length of body	..	..	..	..	..	6 ft. 5 in.
Length of tail	..	..	..	..	..	3 ft. 2 in.
Total length	..	..	..	..	..	9 ft. 7 in.
Girth	..	..	..	..	..	3 ft. 6½ in.
Head	..	..	..	..	..	2 ft. 3¼ in.
Forearm	..	..	..	..	..	1 ft. 5½ in.
Height	..	..	..	..	..	3 ft. 1 in.

We then went on a bit and sent elephants round to beat up a long patch of low grass towards us where the two other tigers had been seen. Here again it was a very fine and jolly sight. Shortly after the elephants had begun beating up to us we saw a tiger coming towards us some 500 yards off. He was still going through the low grass slowly, some 100 yards from us towards our left, when I fired a Mannlicher bullet but, owing to the elephant moving slightly, missed. My second shot, however, hit it in the neck and dropped it in its tracks. Soon afterwards another tiger showed itself coming to our right front from the same direction and yet another to our left! The tiger on the right after a while crossed in front of us at a walk some 150 to 175 yards off and I dropped it with a bullet through the shoulder but it picked itself up again and charged the elephants to our left, scratching one and then lying up opposite them inside the line. The third then galloped across towards our right front and I downed it with a .240 bullet a little far back. I took my elephant up to it and finished it off and then we went up to the other wounded animal. Ranjit Singh said he could see it in the grass lying down opposite him, so I told him to fire. But in accordance with his usual practice he fired at his hind quarters and then a funny sight ensued: Jabbers missed the charging tiger with his second barrel and the next moment he and Bharat Singh were clinging on to the howdah for dear life while the elephant was down on his knees

with the tiger under it, trying to kill it with its tusks. It was for this reason that some days ago I changed from Ram Prasad to Vikram Prasad. Ram Prasad had however with his knees and weight practically done for the tiger but on getting a scratch on the trunk under the right eye he bolted a bit and after it stopped, Ranjit put a bullet into the tiger who, though alive, was really done for and could not get up. Thus ended another red-letter and ever memorable day. All four happened to be tigresses but the three daughters were all grown up ones measuring 8 ft. 3½ in., 8 ft. 3 in., 8 ft. 0½ in. We got back to camp about 3-30 p.m."

The following day, the 1st of April, His Highness obtained his 97th tiger. The 2nd and 3rd and 4th were blank days. The entry for the 5th reads as follows:—

"At last Nishan Tapu has yielded us a tiger but, compared with its reputation, and also the actual hunt, it was disappointing and the tigress led us a rare old dance to-day. Seen early in the morning by our scouts, line of elephants left early after breakfast and we at 1-15. On way heard tiger was ringed in after its having broken through first ring in quicksand patch on bank of Kosi. On our getting there tigress broke through the ring and back through the line in the next attempt before ring was completely made. We then beat it out past me in a small patch by force but the cunning old brute went through the only patch of grass instead of the open and I had a guess shot at her after she had galloped into the tall grass. In the next attempt of the same nature, she charged straight out at my elephant, my two shots getting her in the back just missing the spine and in the nose too far forward. Pools of blood. In the attempt following she got home and slightly wounded my elephant, Gorakh Prasad, in the trunk with claw scratches, who, considering everything, stood wonderfully staunch, though he was rather forced to do so as we were in somewhat quicksandy ground. Hiru's elephant, Sital Prasad, who was on my immediate right, seeing the tiger get home on my elephant knelt down anticipating a charge; and the unsteadiness and moving about of the elephants generally, contributed to bad shooting. Several other elephants were mauled—scratches mostly—during the long and tedious hunt. The last time we forced the tigress out of thick grass I managed to break her left leg, though rather low, and Jeoraj Singh and Nawal Singh opposite whom she was lying down close by, finished her off—a fine tigress 9 ft. 2 in. with two perfectly marked cubs—male and female—which would probably have been born within a week.

Had a somewhat perilous and uncomfortable journey back, as anticipating a pleasant river ride drifting down stream, as in 1908 on the Gandak, I foolishly agreed to Jabber's proposal and came back by boat. Whilst the elephants got back in one and quarter hours it took us two and half hours and we had considerable excitement also through boat striking submerged trees and stumps and bumping on shallow shoals in the dark."

On the 7th April His Highness' shoot was brought to a close.

The following is a Summary of the Nepal shoot:—

17th March to 7th April, 1920.

Tigers	..	..	.. (Self 15 and Hiru 2)	..	17
Arna Buffalo	..	..	(Self)	..	1
Mugger	..	..	(Hiru)	..	2
Total					20



## MEASUREMENTS OF TIGERS.

*Tigers.*

1.	10 ft. 1 in. (7 ft. body)	..	..	..	Hindalwa, 21st March.
2.	10 ft. 1 in. (3 ft. 1 in. head)	..	..	..	„ 23rd March.
3.	9 ft. 6 in.	..	..	..	„ 26th March.
4.	9 ft. 5 in. (shot by Hiru)	..	..	..	Bankulwa, 18th March.
5.	9 ft. 3½ in.	..	..	..	Hindalwa, 1st April.
6.	8 ft. 5 in. (Old tiger) ..	..	..	..	Bankulwa, 23rd March.
7.	6 ft. 10½ in. (Three-quarter grown cub)	..	..	..	Sundar Gonar, 29th March.

*Tigresses.*

1.	9 ft. 7 in. Record Tigress (6 ft. 5 in. body)	..	..	..	Hindalwa, 31st March.
2.	9 ft. 2 in. (6 ft. 5 in. in body)	..	..	..	„ 5th April.
3.	9 ft. 2 in. (2 ft. 4¼ in. head)	..	..	..	Bankulwa, 20th March.
4.	8 ft. 8 in.	..	..	..	„ 24th March.
5.	8 ft. 6½ in.	..	..	..	Hindalwa, 27th March.
6.	8 ft. 5 in. (shot by Hiru)	..	..	..	Sunder Gonar, 29th March.
7.	8 ft. 3½ in.	..	..	..	Hindalwa, 31st March.
8.	8 ft. 3 in.	..	..	..	„ 31st March.
9.	8 ft. 0½ in.	..	..	..	„ 31st March.
10.	6 ft. 7½ in. (Three-quarter grown cub)	..	..	..	Sundar Gonar, 29th March.

## LOCALITY OF BAG.

Hindalwa	..	..	..	..	..	10 Tigers.
Bankulwa	..	..	..	..	..	4 „
Sundar Gonar	..	..	..	..	..	3 „

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Total .. 17 Tigers.

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## No. IV.—ON THE METHODS OF MEASURING TIGERS.

In No. 3, Volume XXVI of this Journal, H. H. the Maharaja of Dhar gave some notes on the length of tigers and panthers shot in his State. Recently in the Field—there appeared a photo of what was stated to be the record tigress which had been shot by H. H. the Maharaja of Bikaner—Reference to this tigress is made in the notes from His Highness' diary which by his courtesy are reproduced in this number together with a photo of the tigress.

In No. 1 of this Volume Brig.-Genl. R. G. Burton asked how the measurements of the Maharaja of Dhar's tigers and panthers were taken and stated that measurements round curves must always be unreliable as no two people are likely to take them alike. He considered that no measurements could be judged satisfactory unless taken in a straight line between pegs, the tail being measured separately.

The Editors wrote for information on this subject to both the Maharaja of Dhar and the Maharaja of Bikanir and were advised that the measurements had been taken round curves “this being the ordinary accepted way.”

The controversy as to the correct way of measuring tigers is very ancient as will be seen from the following extracts from the *Asian* of December 23rd, 1879. The extracts are from a letter to the *Asian* dated Purneah, 1st November 1879, and signed “Joe” (J. L. Shillingford). Joe writes:—

## “LENGTH OF TIGERS.

“In the columns of this Journal a good deal has been written on this subject, resulting evidently in no definite solution of the vexed question. “Naturalists, and even sportsmen, are still sceptical regarding the utmost



"length and size it is possible for a tiger to attain. I have ventured to record the result of my experience to assist towards settling this much controverted matter. During a career of over thirteen years, as a sportsman, chiefly in Northern Bengal, I have had the satisfaction of registering the death of about 170 tigers. The measurements of some of the largest, both male and female, are appended below, in a tabular form. The dates on which they were shot, and the initials of the party present are also mentioned. Invariably all were measured prior to being skinned, and in presence of the assembled group of sportsmen, generally on the very spot where they had been killed, before being 'padded' for removal to camp.

"The method of measuring is as follows:—

"Applying the tape to the tip of the nose, it is carried along the middle of it, to between the ears, then along the vertebrae to the root of the tail, which appendage being straightened out, the measurement is completed to the end of it."

It will be seen that "Joe" measured in the same way as the Maharaja of Bikanir's tigress was measured.

The length of the largest tiger, shot on the 3rd November 1868, is given as 11'5". Four tigers 11' in length are recorded and detailed measurements of one of these shot at Purneah are given, namely:—

Tiger.—						Feet.	Inches.
Length	..	..	..	..	..	11	0
Girth round chest	..	..	..	..	..	4	6
Circumference round head	..	..	..	..	..	2	10
Tail	..	..	..	..	..	3	4
Round fore-arm	..	..	..	..	..	2	2
Height	..	..	..	..	..	3	7

"Joe" mentions 6 tigresses whose dimensions are larger than the one shot by H. H. the Maharaja of Bikanir. These six measured 10'-2" (shot 15th September 1867), 9'-8" (6th November 1868), 9'-11" (shot on 8th April 1870). Amongst the shikar party was Lord Mayo (the Governor General), 9'-8" (22nd August 1870), 9'-11" (28th August), 9'-7" (22nd April 1872).

"Joe" was firmly convinced that tigers in Central and Southern India never grew to the same length as those in Bengal, he compares the dimensions of the 11' tiger shot in Purneah, and which are given above, with another shot in Southern India which measured:—

						Feet.	Inches.
Length	..	..	..	..	..	10	2
Girth round chest	..	..	..	..	..	6	1
Circumference round head	..	..	..	..	..	3	5
Tail	..	..	..	..	..	3	1
Round fore-arm	..	..	..	..	..	2	10
Height	..	..	..	..	..	3	9

He writes:—

"The tiger of Bengal is simply built, with a small head, long tail, small pug, and a smooth glossy skin, the black stripes are narrow and very dark, with perfectly white coloured hair under the stomach. The habits are much more retiring and sequestered, and its depredations confined chiefly to cattle and wild animals, very seldom attacking human beings, even though chance offers an easy victim. I lived for seven years in one of the most tiger infested portions of this district during which period I shot 63 tigers, and only heard of some ten or twelve natives being killed, most of whom were shikarees out on

“ shooting excursions. There were very few villages, and these far apart, with narrow footpaths, through heavy grass and underwood jungles, leading from one to the other and if the tigers were so inclined they could kill bipeds daily without exposing themselves to view, still very few villagers were ever carried away.

“ The tigers found in Southern India, judging from measurements and descriptions recorded, are more solidly built, have larger heads in proportion to the body, and very expanded pugs. They have short tails, and as far as I have been able to ascertain, the skin has more of a yellowish hue, than those of Bengal. They are more addicted to man killing, and fearlessly approach human habitations when pressed by hunger. I dare say the hilly nature of the country they have to live in, has good deal to do in their being more muscularly than those infesting the plains of Bengal.”

Commenting on the above in the *Asian* of 20th January 1880 “ Young Nimrod ” writes :—

“ I think it should be conceded that the tigers inhabiting Northern Bengal and the Terai must be pronounced to be longer but not so well developed as those of Southern and Central India, and this I never doubted. The same may, I think, be said of the tigers of the Sundarbans, and I so described them in my article on the Royal Bengal tiger, which appeared in the *Oriental Sporting Magazine* for November 1872, p. 520. Your correspondent ‘Joe’ has furnished in a tabulated form much valuable information regarding the length of numerous tigers, four of which are stated to have reached exactly 11 feet, and only one to have attained beyond that length being five inches above it. Now I have always contended that a tiger over and not up to 11 feet is a desideratum, and I have therefore only to deal with the animal represented to be 11 feet 5 inches. Of course if the measurement had been accurately taken, there would be nothing further to say on the subject and I should be glad to admit that I had at last found a tiger exceeding 11 feet in length. But ‘Joe’ has favoured us with the method of measurement adopted by him, and this shows a radical defect, which proves that the measurements were not perfectly accurate. The mode of measurement practised appears to have been to pass the tape—was the measuring tape invariably used or a piece of string afterwards measured, and did the sportsman or the servants take the tape along the length of the tiger—from tip of the nose to the extremity of the tail following the undulations of the body in a line therewith? The part of the above sentence I have italicised shows that the measurement was inaccurate—inasmuch as it does not represent the exact length of the animal. I am quite sure that ‘Joe’ would never think of taking the height of a horse by measuring from the heel to the shoulder by following the curves of the body from one point to the other? Then why should the length of a tiger be measured in a different manner? In the former case any Steward of a Race Meeting would reject the measurement taken, and in the latter Naturalists have no option but to act in the same way. I observe that the length of the tiger shot on the 18th April 1870, when the G. G., the late lamented Lord Mayo, was out with the party, is stated by ‘Joe’ to have been 11 feet, while another of the same party, A. P., of Calcutta, I think the late J. H. G. told me, who furnished an account of that shooting excursion to the *O. S. M.* (see No. for July 1878, p. 1220), says it was ‘11 feet 1 inch.’ Who is right? I presume ‘Joe’ is; yet it shows how apt mistakes as to measurements are liable to occur, and how very careful it is necessary to be in such matters.”



"Joe" replies to Nimrod's comment:—

"The manner of measuring tigers, scientifically speaking, is certainly open to objection; but it must be recollected universal custom warrants the style adopted by me. If from time immemorial the height of a horse had been measured by a tape instead of a rod, it would be the accepted method now; therefore, if I were to place a stake at the nose, and another at the tip of the tail, and then register the length of a tiger, instead of carrying the tape along the back, my way of measuring would decidedly be the exception and not the rule."

"To further satisfy sceptics, I will now state that all the measurements recorded were taken by me personally or else by some member of the party there present; a tape carried out for the purpose was always used, and I may here add, the one I use is made of steel and has assisted in taking the dimensions of several scores of tigers."

He adds that the skeleton of a tiger 11' long was handed over by him to the Indian Museum in 1871. A lengthened description of this tiger by "Bruiser" is given in the *Oriental Sporting Magazine* for July 1871.

The Society possesses the skull of a very large tiger shot by Mr. J. L. Shillingford in Purneah. Records of this tiger's body measurements are not available but the skull is  $14\frac{1}{2}$ " in length. The record skull according to Rowland Ward is  $15\frac{3}{4}$ " and was shot by the Maharaja of Cooch Behar.

We shall be glad to hear from members of the Society on the above subject—  
EDITORS.

#### No. V.—NOTES ON PANTHERS.

In the *Journal* of our Society, Vol. XXVI, No. 3, page 841, is an interesting article by H. H. The Maharaja of Dhar on the big game of the Dhar State. I note that out of 106 panthers shot no less than 8 have taped eight feet in length.

The *Indian Field Shikar* book, third Edition, 1906, mentions only four panthers of 8 feet and over, viz., one shot by Capt. A. G. Arbuthnot (the longest on record) 8 feet  $5\frac{1}{2}$  inches. One shot by the Maharaja of Cooch Behar measuring 8 feet 4 inches. One of 8 feet 3 inches shot in Gurhwal; and one of 8 feet shot in Pauna.

I fear I am a sceptic in the matter of measurements. I speak from experience as I have been in at the death of well over a hundred panthers and not one of them approached 8 feet when measured between upright stakes. This experience covers India from Assam to Kathiawar.

Of this large number, the longest taped 7 feet  $5\frac{1}{2}$  inches immediately after death, he was a long lithe beast, built like a grey hound, old, and very light coloured. The story of his end is rather interesting:—I was walking through the Gir forest in the month of April 1913 examining the watershed of the hills with a view to finding a suitable passage for a Railway. After mid-day I sat down in a patch of long grass under a huge banian tree for a rest and a frugal lunch, the latter was just finished when my attendant tapped me on the shoulder and pointed to a large panther walking through the grass about 30 yards away. I had a smack at him with my 300 H. V. but the bullet was deflected by the grass and struck him high up in the loins. Curiously, he did not answer to the shot, and as there was no blood on the trail it looked like a miss. Half a dozen armed forest guards joined us, and we followed up the track; after going about 70 yards there was a huge splash of blood on a dry teak leaf, and of course every one rushed to examine it. Whilst we were bending down, there was a hoarse grunt and we looked up to see the panther almost on us. We all had a bang at him, and he rolled over at our feet simply riddled with buck-shot and bullets.



My companions were the famous Mekranis of the Gir, the staunchest shikaries I have met, but sad rogues and poachers in ordinary times.

The next longest panther was 7 feet 4 inches in length, a very heavy massive beast, also a Kathiawari; he was killed in May 1919 in the gardens to the North of Junagad town. It was in the height of the recent famine, the heat was very great, there was no water on the Girvad hills, the whole place was burnt, and all the trees had shed their leaves, under such circumstances life on the bare hill sides must have been very distressing, so this panther left the jungles and took up his abode under the dense shade of the mango trees in the State gardens. The men guarding the mangoes on going their rounds disturbed him, and one man was severely mauled; the panther moved to another part of the garden, was again disturbed, and mauled a second man; this continued until no less than six unfortunate men had been cruelly mangled. Curiously, all the victims were bitten and clawed in exactly the same part—the right shoulder and upper arm. *Khubber* was telephoned up to me in the late afternoon and about 5 o'clock I started out. On my way to the gardens I met several of the victims being carried to the hospital, and must confess I felt a certain amount of diffidence in meeting this ferocious brute.

It had been a dreadfully hot day—116° in the shade—with hot winds blowing which may have accounted for the panther's bad temper. We found him stretched at full length under a small Karunda bush beneath a large mango tree, he lay with his jaws agape, panting heavily, evidently much distressed with the abnormal heat. We crept up—under cover of a low aqueduct—to within 20 yards of him, and one shot in the chest from my .350 H. V. settled him. He was a massive beast, quite the heaviest I have seen.

The remaining males of the hundred odd mentioned above gave two or three measuring 7 feet 2 inches, the usual length was 7 feet or slightly under. All measurements were strictly honest, taken between stakes, and not along the curves, (this latter generally adds 2 or 3 inches to the length) and before the animal had stiffened.

The Kathiawar panther differs considerably in colour from the Bengal; the skin of the latter is more black and white, with large open rosettes, glossy and bright in appearance, eminently suitable to the heavy dark forests with bright chequers of sunlight shining through the trees. The Kathiawar skins are dull and rusty, with spots more crowded, the lighter colouring suits the open dust coloured Gir forests admirably. It is astonishing to see how perfectly the panther's colouring blends with the back ground, a moving panther is fairly well seen but directly he stops he seems to vanish, and his outline is picked out with difficulty. It is this fact that makes the following up of wounded panthers so exceedingly dangerous. I once followed up a small female, shortly before dusk in scrub jungle, I actually trod on her tail without seeing her, but fortunately for me she was stone dead, having made a dying rush of 50 yards or so with a ball well placed behind her shoulder. I will give another instance of the extraordinary invisibility of panthers and incidentally of the damage they can do when one would imagine they were "*hors de combat*." It was in a beat, a small female trotted past me. I fired with a .300 H. V. shattering both her forelegs above the elbow. She rushed into an isolated thicket of low shrubs and nothing would move her. Whilst we sat debating how best to finish her off a vainglorious villager seized a sword and dashed into the thicket after the wounded beast, shouting that we were all afraid and that he would show us how wounded panthers should be finished off. The foolish hero very nearly stepped on the panther which sprang up on its hind legs, bit the man in both shoulders and gave him a bad mauling generally; we threw all caution to the winds, dashed in to the rescue and my sporting cook brained the panther with an axe.

The village hero spent a month in hospital, and was lucky to escape with his life.

Caged panthers have been known to escape in Kathiawar, and at least one Chief has "put down" tame panthers to stock his jungles, this probably accounts for the variation in colouring, etc., occasionally met with as the purchased animals may be African, Malay or Bengal.

Two years ago one of these "bag" panthers came over our frontier and started man eating. After wandering about 100 miles across country, he finally settled down in open grass country, attacking the women working in the neighbouring fields and the children tending cattle in the grass. His attacks were always made in broad day-light and after a few deaths the country became panic-stricken. All field-work ceased, and moving outside the villages at any time became a night-mare.

I went out after him in mid-April and put Wali Mahomed (the finest tracker in the Gir) on to his trail. The first day he eluded the trackers, but the second day they found him asleep under a small bush. *Khubber* was brought to me about half past five in the evening, no time was to be lost as our quarry was 8 miles away over stony hills and we had to cross several big rivers with rocky beds full of boulders. Wali Mahomed carried a goat across his saddle and I carried a heavy rifle; a sharp gallop brought us to the spot just as the sun was dipping on the horizon. We tied up the unfortunate goat and sank behind a small bush. Within two minutes the panther appeared on a small hillock, and after satisfying himself that the coast was clear, rushed in and killed the goat. I killed the panther, and found him a full grown male of the Bengal type, 3 to 4 years old, 6 feet 10 inches in length, not heavily built, skull 9" by 6½". The hair on his face and sides was rubbed off by the bars of his cage though he had been free for nearly a year. In this short time he had killed 14 poor villagers.

There is one man-eating panther in the Gir forest. I believe it is a female—probably with cubs. She kills spasmodically; for four successive years she has killed and eaten one child in each monsoon. The place is very difficult to reach in the rains and with the fever, mosquitoes and other biting flies the discomforts are too great to permit of camping in the forest at this season. I ventured out once, was eaten alive by mosquitoes, and had no luck, chiefly owing to too much *bundobast* made by an over-zealous police inspector.

The Rabaris or buffalo herdsmen of the Gir live in the most primitive shelters at all times, a ring of thorns with a few upright sticks covered with coarse grass form their only habitation, this structure is abandoned when the grazing near by is consumed, the graziers then seek pastures new and form a new hamlet.

The lions and panthers of the Gir move from their lairs shortly before sunset and make straight for the nearest Rabaris' hamlet, if they find no victim, they move on to the next settlement, if they fail to find a straggler from the byres they will sit patiently outside. As the cattle are driven out to pasture long before daybreak killing is then an easy matter. The four little girls mentioned above were carried off about dusk or dawn when visiting the edge of their camp, in each case the only trace left was a bare skull.

I have seen tiger, panther, and Indian lion approaching their kills dozens of times, and have watched many panthers kill goats tied up as bait. Some famous artists have painted pictures of these big cats on the prowl, with ears well laid back, head a few inches from the ground, body stretched to its greatest length and every muscle tense and strained. As far as my experience goes this is entirely wrong. They walk along quite naturally to within a few yards of their victim—stopping occasionally to look all round for the goat-herd—then settle themselves down *ventre-a-terre* with the hind legs well doubled up underneath, and then come with a terrific rush on the poor goat who has probably watched the whole performance. The attack is always made in silence, and is



so quick that details cannot be observed, but the goat is nearly always seized by the throat. Most panthers straddle the goat, some lie down at full length. In all cases the goat is held until life is extinct. On steep hill sides, or in places where there is little or no cover, the attacking rush may be from a considerable distance (100 yards or more).

In several instances I have seen a panther come trotting along a jungle path and go straight at the goat without increasing his pace.

Panthers are very cautious on approaching a kill, they walk along slowly and silently but neither stooping nor crawling, they stop at frequent intervals and look carefully around, when quite satisfied that there are no intruders they sit or lie down close to the kill; females appear to be much more cautious than males (I have noticed the same with tiger) and frequently stare long at the machan, if not quite satisfied they walk away and lie down at some distance until it is quite dark when they again approach the kill for a feed.

When a panther receives a wound, mortal or otherwise, he invariably makes a mad rush for the nearest heavy cover. It is astonishing how their instinct leads them to the most difficult and inaccessible cover in the vicinity.

In my experience panthers do not appear to possess a keen sense of smell, either this or they do not worry about the near presence of man, provided the latter keeps absolutely still. On many occasions I have sat in a thick thorn shelter, or a hole in the ground covered with a charpoy or a cart-wheel, with heap of thorns and green stuff piled on the top; the panthers have passed this without noticing the deceit. On one occasion in difficult ground I hollowed out a cactus bush and sat in this, closing the entrance with thorns and green branches, leaving a loop-hole facing the kill; the panther walked all round my shelter sniffing, and quite satisfied there was nothing wrong; when he came in front of the loop-hole I shot him through the head.

Their sense of sight and hearing is very acute, any movement however slight is instantly detected; the jungle may be disturbed by the noise of falling leaves or branches, squirrels or birds racing over dry leaves, etc., of these the panther will not take the slightest notice, but if the shikari touches a dry leaf or the machan creaks ever so slightly the beast is instantly on the alert and either stares straight at the source of the sound or bounds off at once. As with the hunting of all wild animals it is wise to have the setting sun at one's back if this is possible; this places the quarry at a disadvantage.

In tracking up spotted deer in the early morning I have frequently come across panther. Chital always bell when they see the great cats, it is a short sharp note, quite different from their usual musical call. When the panther's stalk is disturbed by man, the beast gives a few grunts and makes off. The Gir shikaries profess to be able to pick out the male panther by his deeper note.

Panthers possess one peculiar habit which is not found among lions and tigers. All three are much given to walking along roads and footpaths, (The Indian lion particularly, I have followed their tracks for many miles) the panther stops occasionally and leaves a long scratch on the side of the road, never in the middle; this mark is about two feet long and generally parallel to the track, but sometimes at right angles. I have never seen the fact quoted in shikar books, but it is well known to the jungle people who have frequently pointed it out to me in several parts of India. I shall be glad if some of the Members of the Society will confirm my statement.

TOKARVADI, POONA DISTRICT.

E. BROOK FOX, M. INST. C.E.

7th May 1920.

#### NO. VI.—THE HUNTING LEOPARD (*CYNELURUS JUBATUS*).

I have never had the fortune to see the Hunting Leopard in the feral state. I heard of one in the Buldana District of Berar in 1912. I beat up the animal's quarters, but found only tracks. It was said that its mate had been



captured by *pardis*. These animals appeared to be less uncommon in Berar than in many localities. I saw in 1890 the skins of three which had been shot in the Melghat Forest in the Satpura Hills North of Ellichpur by Mr. Ballantyne of the Forest Department. He told me that they all came out in one beat. Captain Winter of the Hyderabad Contingent Artillery shot one at Damangaon near Ellichpur in or about 1894. He saw two or three and shot one when sitting over a kill or a tethered goat. Another was shot in 1895 in the Wun District of North Berar by Captain Barnard, 4th Lancers, Hyderabad Contingent, the animal came down to drink at a pool of water close to him.

In an article in the *India Sporting Review* for February 1857, there is a reference to Chesney's "Journal of the Euphrates Expedition," in which this species is said to be more numerous in Asia Minor than in Persia and Mesopotamia: its occurrence is also noted in Arabia and in the vicinity of Aleppo. The writer of the article says that the chief supply of these animals in Upper India is from the Jeypur District. According to "Buchanan Hamilton," it is found in most of the hilly parts of India, but is nowhere very numerous except near Hyderabad, Deccan. It is stated by Mr. Ure, Surgeon at Hyderabad, that Hunting Leopards were numerous near that place, and live in holes among the rocks on the hills, or rocks that are near the plains which the antelope frequent.

Sir Samuel Baker, in his *Eight Years' Wanderings in Ceylon*, published in 1855, says this animal is common there and "frequently caught at Newera Ellia."

The late Sir Montagu Gerard told me he had ridden down and speared this species in Central India.

CHARLTON KINGS, ENGLAND,  
June 1920.

R. G. BURTON, BRIG.-GENL.

#### NO. VII.—THE HUNTING LEOPARD (*CYNÆLURUS JUBATUS*) IN KATHIAWAR.

I notice in the last number of our Journal under an interesting note on the Hunting Leopard by G.O. Allen, I.C.S., that the Society is anxious to obtain all the information it can regarding this now somewhat rare animal, so am sending the following note on its occurrence in the Province of Kathiawar in the hope that it may be of some value.

According to Blanford's "Mammalia", the Hunting Leopard, does not occur in India, North of the Ganges or anywhere in the Eastern part of the Peninsular, or on the Malabar Coast. How far South it occurs, he is unable to state, but adds that its range is probably nearly the same as that of the Indian antelope.

As far as the Bombay Presidency is concerned I think I can safely say that the only district in which it occurs is in a limited area, situated about the centre of the Province of Kathiawar, and there only in very small numbers.

The antelope is met with, in suitable localities, in most of the districts, ranging from Gujerat in the North down to the Southern *talukas* of the Dharwar districts bordering on the Mysore State, but during the many years I was engaged on Survey work, in the Bijapur, Belgaum and Dharwar districts, I have never once heard of a wild Hunting Leopard having been seen in those parts, although I made exhaustive enquiries amongst the natives, some of whom were acquainted with the animal from having seen tame ones, kept by Indian Princes for hunting purposes.

I am not so well acquainted with the more Northern districts of the Presidency but I think if a Hunting Leopard had either been seen or shot in any of them during my long service in Kathiawar I should most certainly have heard of it. As I have already stated they are exceedingly scarce in the latter Province. In the Kathiawar Volume of the Bombay Gazetteer, it is stated, on the

authority of the late Colonel J. W. Watson, who was a very keen observer and *shikari*, that in 1884, there were not more than twenty *Cheetahs* (the local name, the panther being known as the *dipdo* or spotted one). If any thing the number was overestimated by Colonel Watson, for during the succeeding 17 years, when I was serving in the Province and became intimately acquainted with a greater part of it, I only heard of nine, two of which were shot by natives, in the neighbourhood of Chotila, midway between Wadhwan and Rajkot: two by Mr. S. A. Strip of the Wadhwan Garassia School, within a few miles of the Civil Station, and the remaining five, including two which were speared respectively by Mr. Waddington of the Rajkumar College and myself, by two young officers. These five which consisted of a mother and four well grown cubs were obtained within a short distance of the Rajkot Civil Station during the rains of 1894. *Khabar* had been brought to the two officers by some Koli shikaris, that three panthers had been marked down by them. On reaching the spot with the men, they found the animals lying up under a small bush, in the open, and had no difficulty in shooting the lot as they showed no fight. It was only after the bodies had been brought into Rajkot and seen by others, that they discovered what the animals they had shot really were! The Kolis said they had seen two other larger animals, which it was presumed were the parents as the ones which had been shot were only three-quarters grown cubs, and it was arranged that the men should try and find them, and, that should they succeed in doing so, we should ride them down and spear them.

On the following morning, the news was brought into camp, that they had been found and surrounded, and not an hour later we found them in a patch of long grass between some low hills, and very restless as they were moving about with their tails cocked up and visible above the grass. They broke cover in two different directions at a great pace but we had no difficulty in eventually catching them up rough as the ground was, and spearing them. Like the others they did not show any fight and it seemed a pity that they should have been destroyed but we had no means of catching them alive, there being no professional snarers in the country and sooner or later they were bound to be shot by village *shikaris*. One of them turned out to be the mother and the other, another cub, showing that there had been four in the litter. The coats of all of them were in good condition, but otherwise they were very thin and the mother especially looked half starved. This was as far as I could ascertain the first time that hunting leopards had been seen anywhere near Rajkot and this family of them must have wandered there in search of food from the country round Vichia and Tardan where I was told they are occasionally met with. Their favourite haunt however is the large rugged tract of country, known as the Tanga, which includes the greater part of the districts of Chotila, Chobari, Anandpur, Than, etc. This appears to be their stronghold from which they occasionally wander away into the surrounding plains but never to any great distance. There are other localities further North especially in the directions of Dhrangdhra, Malia and Tankara under Morvi, where antelope are plentiful and other conditions apparently favourable for them but for some good reason or other they are never found very far away from the Tanga limits. The same remark applies to the Southern districts of Kathiawar, including the Gir Forest, the Girnar, the Barda, and Alache Hills, Sihor and the surrounding country. All these districts hold panther, but I have never heard of a hunting leopard having ever been met with in any of them.

It is many years since I left Kathiawar (nearly 20) and although there certainly were a few hunting leopards left in the Tanga country when I did stay there I am unable to state if there are any left there now.

MARSH HALL, SOUTH MOLTON,  
N. DEVON., 15th May 1920.

L. L. FENTON, LT.-COLONEL.



No. VIII.—THE DESERT LARK (*ALÆMON DESERTORUM*).

During the past two months, I have had the opportunity afforded me of watching this bird. As nothing much appears to have been recorded about its habits, I venture to commit my observations to paper as it may interest others who are ornithologists.

This is an altogether peculiar bird and although classed among the larks, his habits are totally dissimilar. His habitat is the desert. He loves sand and is to be found in desolate places, where he runs about, at a considerable pace, over dunes and hummocks. He seldom takes to flight, preferring to footslog. In the non-breeding season, I believe he is silent. When the mating season comes round, he starts displaying. Before doing this, he runs up to the top of a hummock. On arriving, he utters two notes, very like a warning; he then utters three more, not quite so loudly; after this he runs forward three or four feet and then springs up into the air, sort of slantwise, and utters four or five more notes, which brings him to the top of his flight, when he descends to earth again, as though "side" slipping. He shows off his wings and opens his tail out, in fact makes as much display as he can of his beauty. The song is very pretty and the whole show delightful to watch. He does not rise more than 15 or 20 feet. On descending, he again mounts a hummock and continues the display at short intervals.

In order to find his nest, the best method to pursue is to get on to his haunts. On arrival one just stands and listens. If he is displaying, his voice will soon be heard. This must be followed till he is seen. If there is a nest about it is perfectly easy to find, for after each display, he returns to the same hummock, all that then remains to be done is to search round all the hummocks in the vicinity, where it is sure to be discovered. If there is no nest, he does not return to the same hummock to display, but runs along to another and so on.

In this manner I have discovered 5 nests this season and will endeavour to describe them.

On the 26th April, I came on a cock displaying. I stood and watched him. Almost at the same moment, to my delight, I saw the hen running along quite close by with building material. I hardly had time to realize it, when she flew a little distance to the foot of a hummock, on which was a low tamarisk bush and hopped on to it. I had found the nest. The nest was placed on the bush about a foot or so off the ground. First of all there was a regular platform on which the nest proper was built. This was a good solid affair, well finished off with a deep cup, bound with soft material. The whole must have been nearly 12 inches deep and a good 9 inches across. There was no effort to conceal the nest. It simply hit you in the face. Nothing could be less lark-like! On visiting the nest a week after I found it deserted, much to my disgust.

On the 9th May, pursuing the same method I found another. This was exactly similar to the other in structure but it was placed on the ground among some coarse grass on a hummock. There was no difficulty in finding it as it was so conspicuous. On the 11th I got three fresh eggs from it.

On the 25th May, I found two more nests being built. These were identical with that found on the 11th, *viz.*, placed on a hummock, on coarse grass and absolutely visible. On the 31st May, I got two eggs from one. I was afraid to leave them in case they might disappear. On visiting the other it was found to have been buried in the sand and was invisible. After the 25th May, heavy rain had fallen and apparently water had come down and gone over it, burying it. However, I was lucky enough to find that the birds



had only shifted a short distance away and had started another nest. This was situated in the fork of a small tamarisk about 12 inches off the ground and was solid and very well built. To-day I obtained 3 fresh eggs from it.

Although a lark it is very abnormal. To begin with, it likes the desert, then it prefers its legs to the air, it does not make a lark's nest, in that it does not use a hollow, but builds a massive affair, most conspicuously placed, and even takes to the fork of a small bush. Finally, its eggs are a china white covered with brown, grey and black specks. There is a small zone formed at the larger end, but not very conspicuous. The specks and spots do not obliterate the ground color. In fact, no egg could be less lark-like.

KARACHI,

R. M. BETHAM, BRIG.-GENL., M.B.O.U.

8th June 1920.

#### NO. IX.—ON THE OCCURRENCE OF THE LARGE BROWN THRUSH (*ZOOTHERA MONTICOLA*) IN SIMLA.

In the list of birds found in the Simla Hills (J.B.N.H.S., Vol. XXVI, No. 2, p. 609) it is stated that only a single specimen of the Large Brown Thrush (*Zoothera monticola*) has been seen and procured—on 21st April 1916—in the years. It may perhaps be of some little interest to observe that I met with this bird on two occasions last year. I find from my notes that I first saw a specimen on 25th October. It was frequenting a small, narrow, damp ravine (elevation about 6,500 ft.) which broadened out at either end. I came across the bird suddenly round a bend and it flew off at once at a great pace some distance up the ravine. I endeavoured to follow it up and succeeded in approaching to within about 50 yards, but it was very suspicious and flew off again through the bushes and trees up the hillside. The steep nature of the sides of the nullah prevented me from following the bird and I left the spot for a time, returning again after an hour or so. I was pleased to find that the thrush had also come back, but, if anything, it was as shy as before, and darted up the hill through a clump of deodars and vanished. From the little that I saw of the bird I noticed that it was hunting for food in the bed of the nullah and on fairly large boulders, especially if these had any mud on them. I came across the bird (the same specimen presumably) again on 2nd November, but it gave me no more than a hasty glimpse as it disappeared over the side of the nullah. On the first occasion that I saw it I had no gun, and on the second occasion it was a difficult matter to shoot it! I have not seen the bird since although I have often visited the spot where I first saw it.

There is an exceedingly interesting note (Vol. XXVI, No. 2, pp. 668-669 of our journal) on this thrush by Mr. S. J. Martin who says that the bird is fairly common in his district (Kumaon).

Unfortunately, Mr. Martin has not found a nest and cannot, therefore, give us first hand information as to nidification. Is it possible that the bird remains in these parts (Simla) for the major portion of the year and breeds in about May or June?

Not long ago I secured a copy of a somewhat little-known book entitled "Birds of Darjeeling and India" by L. J. Mackintosh, and, on a perusal of this work I found a note on the habits and nidification of *Zoothera monticola*. I quote the following for what it may be worth:—" *Zoothera* prefers high altitudes. A few may be met with, at times, in Darjeeling, chiefly in the cold weather. It is evidently more at home on the Singalillas, in dense bamboo and rhododendron jungle and where more or less luxuriant forests exist, where the ground beneath is damp and moist. *Zoothera* has given not a little trouble to get it to betray its nest so as to learn a little of its nidification. This thrush seldom perches on trees. It is generally found on the ground, scraping away dead leaves which lie in thick layers in some dense shady retreat damp and forbidding,

tossing the leaves about with its ample-sized bill, as though it were in the General Post Office sorting letters. It is not the leaves, however, that it directs its attention to, but the tit-bits in the way of grubs that it is intent on. The nest of *Zoothera*, which I found by some lucky chance, is a biggish mound of damp green moss outside, neatly rounded of sides, broad at the base, and tapering a bit towards the top. Inside, the nest is a neat, cup-shaped hollow, with soft fibres, black hair-like moss roots, and fibrous shreds off a creeping plant. Eggs are *Temminckin* " (whatever this means !) Presumably the eggs resembled those of *Myiophonus temminckii* in which case they must have been of some shade of grey-green with brown (or pink) markings. There is some resemblance between this description of the nest and eggs and that of the nest and eggs shown to Mr. Martin by Mrs. Goban.

SIMLA,  
7th May 1920.

S. BASIL-EDWARDES.

#### X.—RE-OCCURRENCE OF THE INDIAN PITTA (*PITTA BRACHYURA*) IN THE DARBHANGA DISTRICT, BEHAR.

On the 5th of this month I got a female of this species in some bamboos. The only other occasions on which this species was got here were on the 13th and 21st May 1904 as recorded in Vol. XVI, p. 72 of this Journal ; so that this bird has put in an appearance after an absence of nearly 16 years.

CHAS. M. INGLIS, F.Z.S., M.B.O.U.

BAGHOWNIE FTY., LAHERIA SARAI,  
16th May 1920.

#### No. XI—SOME BIRDS OBSERVED IN SOUTH WAZIRISTAN.

On the 24th May I was delayed by the effects of a severe hail storm at Piazza Raghza, a camp situated on a plateau 5,000 feet above sea level in the Tank Zam valley of South Waziristan. I noted the following birds there during the day and evening :—

All common.	{	Paradise Fly-Catcher.	<i>Terpsiphone paradisii.</i>
		Sooty Fly-Catcher.	<i>Hemichelidon sibirica.</i>
		Spotted Fly-Catcher.	<i>Muscicapa griseola.</i>
		Indian Golden Oriole.	<i>Oriolus kundoo.</i>
		Black-headed Jay.	<i>Garrulus sp.</i>
		Magpie.	<i>Pica rustica.</i>
		Bay-backed Shrike.	<i>Lanius vittatus.</i>
		Rufous-backed Shrike.	<i>L. erythronotus.</i>
		White-cheeked Bulbul.	<i>Molpastes leucogenys.</i>
		Jungle Crow.	<i>Corvus macrorhynchus.</i>
		White-breasted Kingfisher	<i>Holcyon smyrnensis.</i>
		Spotted Kingfisher.	<i>Alcedo sp.</i>
		Myna.	<i>Acridotheres tristis.</i>
		Blue Rock Pigeon.	<i>Columba intermedia.</i>
		Drongo.	<i>Dicrurus ater.</i>
		Grey Wagtail.	<i>Motacilla melanope.</i>
		Sparrow.	<i>Passer domesticus.</i>
		Little brown Dove.	<i>Turtur cambayensis.</i>
		Scavenger Vulture.	<i>Neophron ginginianus.</i>
		Indian Vulture.	<i>Gyps sp.</i>
		Lammergeyer	<i>Gypaëtus barbatus.</i>
		Bonelli's Eagle.	<i>Hieraëtus fasciatus.</i>
		Wire tailed Swallow.	<i>Hirundo smithii.</i>
		Sand Martin	<i>Cotile sinensis.</i>



One	{ Common Indian Nightjar.	<i>Caprimulgus asiaticus.</i>
only.	{ Cuckoo	<i>Cuculus canorus.</i>
	{ Crested Lark.	<i>Galerita cristata.</i>
A few.	{ Sky Lark.	<i>Alauda gulgula.</i>
	{ Dark-grey Bush-Chat.	<i>Oreicola ferrea.</i>
	{ Corn Bunting.	<i>Emberiza sp.</i>

The commonest or most noticeable were the Paradise and Sooty Fly-catchers, Golden Orioles and Magpies ; and Himalayan Black-headed Jays.

The above list of birds extended up to Ladha (near Kaniguram) in the Baddar Toi, branch of the Tank Zam. The foliage was Holy-oak, Willow, Poplars, Mulberries, a certain number of fruit trees in small plateau orchards, and the elevation extended to 5,500 feet.

The numbers of birds of course would be very much greater than this list. This list merely indicates the birds which were immediately noticeable whilst moving up the valley.

CORRIE HUDSON, COL., I.M.S.

DERA ISMAIL KHAN,

31st May 1920.

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No. XII.—ABNORMAL COLOURED EGG OF THE PHEASANT—  
TAILED JACANA (*HYDROPHASIANUS CHIRURGUS*.)

As is well known this bird usually lays olive-brown coloured eggs varying in depth of tint. On the 28th of May this year I got a clutch of four ; three were of the usual olive-brown colour, but one of those was spotted with brown; the fourth was of a beautiful pure pale greenish blue or sea green in colour. They were all of the usual peg top shape and quite fresh. Colonel Butler writing in "Hume's Nests and Eggs" says :—"One egg I possess, which I took out of a nest containing three other fresh eggs of the olive-brown type, is pale sea green all over. I have never seen another Jacana egg like it."

This is the first time I have ever seen a pale sea green egg of this species and I must have seen hundreds of eggs nor have I heard of one being got since Colonel Butler wrote the above. The 6th May is the earliest date on which I have found eggs of this species.

BAGHOWNIE FTY.,  
DARBHANGA DISTRICT,

7th June 1920.

CHAS. M. INGLIS, F.Z.S., M.B.O.U.

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No. XIII.—EVERSMAN'S REDSTART. (*PHÆNICURUS*  
*ERYTHRONOTA*, EVERSM.)

The spell of cold weather in January 1903 having brought this beautiful Redstart prominently before my notice, I had occasion recently to look up various points connected with it, and finding the information in the Fauna of British India to be somewhat meagre and out of date, consider it may be of interest to set forth the results of my investigation.

In the Fauna it is stated that Eversman's Redstart is "a winter visitor to every portion of Cashmere, extending on the west to Hazara and Afghanistan, and on to Asia Minor. The most easterly locality from which I have seen a specimen of this bird is Kotokhai in the Himalayas. In summer this Redstart is found in Turkestan, and even in Mongolia and Siberia, if *R. alaschanica*, Prjev., should prove to be the same species as is probable." I may remark first of all that Hartert (Vog. Pal. Fauna. I. 728) has kept the latter bird as a separate species although the two forms are certainly very closely allied. Hartert gives



the range of one bird in greater detail, as in the breeding season from Turkestan to the Altai Mountains and Lake Baikal; on passage throughout Turkestan, Transcaspia, and East Persia; in winter the basin of R. Tarim (Turkestan), Southern Turkestan, Cashmere eastwards to Kotokhai, Afghanistan, and Bushire on the Persian Gulf. Recorded also in Asia Minor and the Ural Mountains.

I find however that Eversman's Redstart must come more regularly into British territory and the plains than may be understood from the above account.

From Quetta, Meinertzhagen writes (*Ibis*, 1920, p. 166.):—"A common winter visitor to the Quetta district from early November to the middle of March, a few old cocks assuming full breeding plumage before departure. It was noted that some females remained a few days after all the cocks had left, the last cock being seen on 13.iii and the last hen on 18.iii". Marshall had previously recorded it as common in winter at Quetta (*Jour. B.N.H.S.*, xii, 603).

It must occur commonly all up the N. W. Frontier in winter judging from the following records. Whitehead writes, in the (*Birds of Kohat and Kurram*) (*Ibis*, 1909, p. 219), "Fairly common, especially in the Miranzai Valley, from December till March, and on the Samana from October till the end of March, chiefly frequenting scrub-jungle, olive groves, and avenues. The call is a peculiar croaking note sounding like *gre-er*. The male assumes nearly full breeding plumage before leaving. Not observed in the Kurram Valley." Hume long ago (*Ibis*, 1871, p. 403) recorded it as common at Murdan. Mr. A. E. Jones informs me that he has seen it at Risalpur, Nowshera, and Dera Ismail Khan.

Proceeding further north but more into the plains we find that Hume says this Redstart is a regular winter visitor to the Peshawar Valley, reaching at least as far as Attock (where it was very numerous during the cold weather of 1869-1870), and leaving early in April (*Ibis*, 1870, 530., *Stray Feathers*, iii 219). He also says elsewhere (*S.F.* ix, 327.) "very common throughout the winter months about Attock, in the Khyber, and generally about the bases of the hills N. W., W., and S. W. of the Peshawar Valley."

Mr. A. E. Jones found this bird during the winter of 1918-1919 about Campbellpore; he first saw a male on the 15th December, and in January it became fairly plentiful. He goes on to say in *epistola*: "The country round Campbellpore is anything but suitable to a bird of arboreal habits and it was surprising to see how the bird accommodated itself to its surroundings, *i.e.*, small hamlets round which are a few "sheeshum" and "neem" trees, leafless at this season, on what is otherwise a barren plain. In February when it started warming up, the birds' numbers rapidly decreased and during the past fortnight not one was observed."

In the neighbouring station of Rawalpindi, Eversman's Redstart was also apparently common the same winter; for a valued correspondent Mr. B. H. Bird, I.C.S., kindly informed me that he had seen some on various dates between 31st January and 24th March, and sent me specimens in verification of their identity.

On the Himalayan side of the Punjab I have not found many records. At Gilgit, Biddulph obtained two males in December and January (*S. F.* ix, 327), while Scully writes (*S.F.* x, 115) "This Redstart is a winter visitor to Gilgit and is common at an elevation of 5,000 feet from the middle of October to the first week in March."

Of the Chitral Valley, Biddulph writes: "It appeared to be common in the upper part of the Chitral Valley in November when I procured several specimens of both sexes" (*S.F.* ix, 327). This was amplified later by Perreau (*Jour.*, B.N.H.S., xix) who says "very common down to 4,000 feet on the waste stretches in bushy parts in winter from November to February. Not seen after middle of March."

Kashgar "in winter" (S.F. iii., 219) and Cashmere "in spring" (Jour, B.N.H.S.) are further notes that I find. Mr. A. E. Jones in a letter, dated 3rd February 1920, informed me that he had just received a female in the flesh from Simla.

I am now able to record a considerable extension of the range of this species into the plains, in that I have met it in the district of Jhang (S.W. Punjab). A male was first obtained on 18th February 1918 near the town of Shah Jiwana, and a female was shot about 10 miles from the same place (at the Rivaz bridge over the Chenab river) on 12th January 1919. No other individuals were seen in those two winters, but the following winter a great number arrived in the district. The first two birds were seen on January 1st but no more were noticed until January 12th after which they were observed in abundance until the end of the month. Two only were seen in February, both on the 13th. From my notes it appears that I personally saw 50 individuals in all. All these birds were in the area which lies between Jhang and the Sharpur district boundary on both sides of the Chenab river. They were found for the most part either in the avenues of kikur trees which line the canal banks, or in groves of small kikurs often in most arid spots. The alarm note, which was excellently described by Whitehead as a croaking "gre-er," also be compared to the sound of a miniature watchman's rattle; the ordinary call is a softer slurred version of the same. The species is easily distinguished in the field from the common Indian Black Redstart. The colouring of the male of course prevents confusion, and the white shoulder patches are conspicuous in flight. The female may be distinguished by the larger size, the whitish markings on the wings, and above all by the habit (common to both sexes) of flirting the tail up and down above the level of the back, whereas in the common bird it is "shivered." The difference of the call notes is also distinctive.

A series of 12 males and seven females was observed all in the months of January and February; all were in typical winter plumage, and showed no traces of moult, except in the case of a single female (26th January) which was moulting a few feathers on the back.

This series yielded the following measurements in millimetres:—

			Bill from skull.	Wing.	Tail.	Tarsus.
Males	..	..	..	14—16.5	84—89	64—69.5
Females	..	..	..	15—16	81.5—86	(one 75.1) 22.5—27
						63.5—69.5

The soft parts were as follows for both sexes; Iris dark brown: orbicular black: mouth yellowish (flesh colour in one bird): bill black: legs black.

HUGH WHISTLER, F.Z.S., M.B.O.U.,

INDIAN POLICE.

JHANG, PUNJAB.

#### No. XIV.—ON THE OOLOGY OF THE NILTAVAS.

A peculiarity noticed in several clutches of the eggs of these birds is that a single clutch frequently displays three distinct types of eggs. In most cases one egg is very heavily freckled, another faintly so, and the remaining one or two eggs are almost without traces of freckles. Exceptions sometimes occur and I have a clutch of *N. sundara* in which all three eggs are heavily marked. This peculiarity is, no doubt, favourable to cuckoos who frequently make use of these nests. I have taken the eggs of both *Hierococcyx nasicolor* and *Cuculus saturatus* from nests of *N. sundara* and if I mistake not that of *C. canorus* from the nest of *N. grandis*.



Oates in the Fauna of British India gives the dimensions of the eggs of *N. grandis* as  $\cdot 9 \times \cdot 7$  and those of the eggs of *N. sundara* as  $\cdot 93 \times \cdot 71$ . The latter is certainly incorrect for it is not likely that the smaller bird would lay eggs larger than those of the larger bird. The average of eleven eggs of *N. sundara* measure  $\cdot 82 \times \cdot 61$  and I have never taken more than three eggs in a clutch though four may be the complete number laid.

E. A. D'ABREU, F.Z.S.

CENTRAL MUSEUM, NAGPUR,

21st July 1920.

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No. XV.—THE OCCURRENCE OF *TEINOPALPUS IMPERIALIS*  
IN THE TOUNGOO HILLS, BURMA.

I write to enquire whether any specimens of *T. imperialis* have been recorded from the Toungoo Hills of Burma.

Bingham in Vol. 2 of his book only records *T. imperatrix* as having been obtained from there, but I have been given to understand that some specimens of *Teinopalpus* caught at Thandaung near Toungoo some years ago and sent for identification were all classed as *imperialis*.

Bingham's description of *T. imperatrix* shows that the chrome yellow discal fascia does not encroach on the discoidal cell. I have obtained about a dozen specimens of *Teinopalpus* from Thandaung in the Toungoo hills and seen a large number of other specimens obtained from the same place and about half the specimens had the discal fascia encroaching on the cell although the specimens appeared to be identical in all other respects. The encroachment on the cell being the same as shewn in the illustration of *T. imperialis* at the end of the volume. The fascia starting from interspace 2 and not from interspace 3 as described for *T. imperialis*.

These butterflies are most common in April but are also to be had in Thandaung in October and I saw one specimen up in Thandaung in October last year, but could not get close enough to catch it as it settled on a large rock a few feet beyond the reach of my net. Bingham also only describes one specimen of female for each variety.

Last April I caught 7 specimens in one morning, one of which turned out to be a female and was identical in all respects with the males, except that it was very slightly larger. There was no doubt whatever about the sex as apart from the entire absence of anything resembling the anal valves of the male, she started laying eggs shortly after being caught and was so full of them that I had to clean the body out to preserve it.

The ordinary females do not appear to be at all common up at Thandaung as in 1918 none appeared to have been seen and last year only three were seen although there was generally someone out after these butterflies nearly every morning and quite a large number of males were caught.

*Ragadia.*

Bingham only records this from Tenasserim in Burma.

I caught two specimens in Thandaung in October 1919 and which appear to resemble *R. critolans*, but there are only 6 ocelli on the hind wing, there being only two of the median ocelli on the hind wing encircled by the same fulvous ring instead of three.

W. SPARKE.

c/o MESSRS. THOS. COOK & SON, RANGOON.

3rd April 1920.



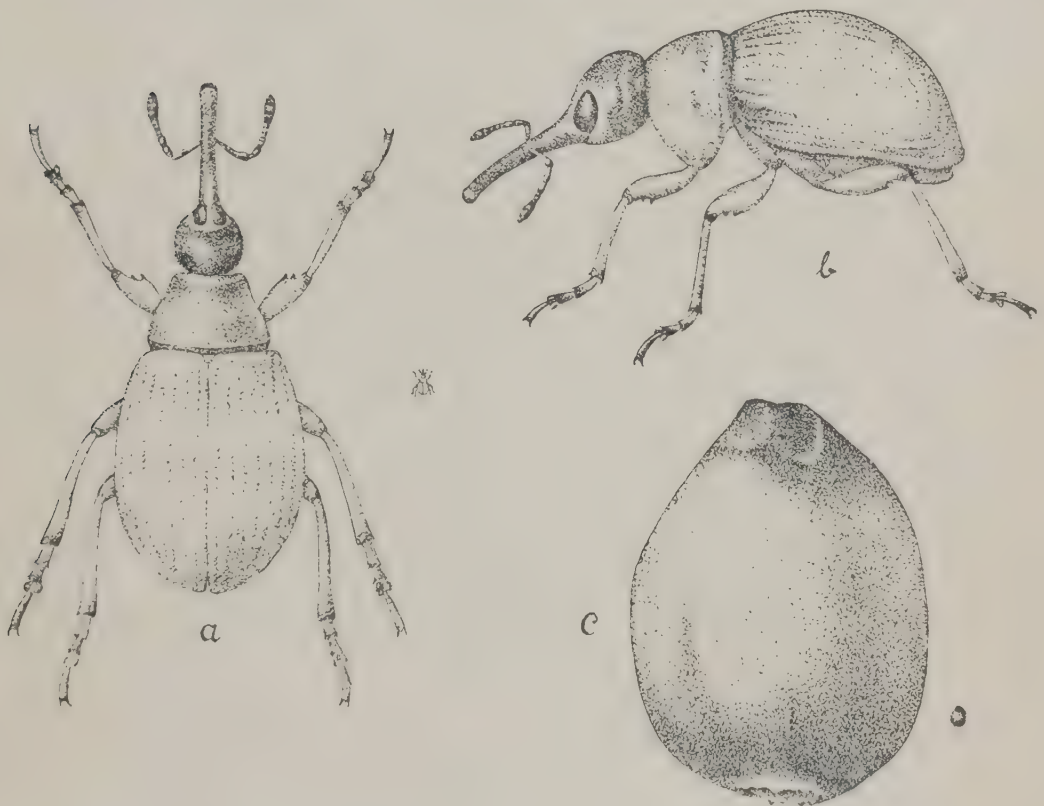
## No. XVI.—THE NAME OF A MESOPOTAMIAN EARWIG.

In a recent number Lt.-Col. F. P. Connor contributed a most interesting note in which he said that he had seen the ordinary large Earwig of Mesopotamia carry off a moth in its forceps. I am able to supply the name of the Earwig, *Labidura riparia*, a widely distributed species, which has occurred in Britain.

P. A. BUXTON.

TRINITY COLLEGE, CAMBRIDGE,  
7th June 1920.

## No. XVII.—“HOPPING” PUPA OF A CURCULIONID BEETLE.



A weevil back (a) and side, (b) view, (c) seed-like body from which it emerges.

The small figure alongside (a) and (c) shows the insect natural size.

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Major Fleming, I.M.D., wrote to us from Lahore on the 28th June as follows:—"I am sending by parcel post a specimen of seed-like bodies, for your examination and kind favour of report. The history is as follows:—

Along the front of one of our barracks at the point where the brick work meets with the ground, from small holes 1 inch to 1½ inches in diameter, these little grains come literally hopping out into the open, their hop is about 2 inches high, or they would, so to say, hop along the ground. They leave their holes about six in the morning and generally hop back again when it

gets hot about 11 o'clock. Their first appearance was noticed about a fortnight ago, they have been growing less in number of late and less vigorous in action. To all intents and purposes when looked at on the ground they have the appearance of bird-seed moving and jumping about under some mystic influence! On keeping they generally die in 48 to 60 hours and if kept in a closed bottle, a small moth or some worm-like object leaves the shell. The specimen sent has been gathered at 8 o'clock this morning the 29th."

We sent the specimens to Mr. T. Bainbrigge Fletcher, F.E.S., the Imperial Entomologist, Agricultural College and Research Institute, Pusa, who kindly supplied us with the following information and drawings of the beetles:—

"I beg to say that I have carefully examined the seed-like bodies, which appear to be some grass-seeds. Each seed is inhabited by the pupa of a Curculionid beetle (weevil) in an early or an advanced stage of growth. From some of the seeds adult weevils are also emerging now in my Laboratory, and they are so unlike anything that we have in our named collection, that we shall have to forward specimens of this to a Specialist in England for exact determination."

Your observation regarding the "hopping" of these "seed-like bodies" is very interesting but I cannot understand how these come "literally hopping out in the open" from their "holes", and how they get back by hopping again. It seems probable that you have nests of a species of ant in the "holes" at the junction of "brick-work" with the ground? The ant may have stored these seeds in her nest little suspecting that these were infested with insect grubs. As is usual with the ants at this time of the year, this ant may also have brought out during the cool hours of the morning, all her stores, etc., for æration and spread them out just outside the nest and took them in again at noon. With the advance of the day and consequent rise in the atmospheric temperature the grubs inside the seeds felt uncomfortable and in their efforts to escape from their captivity jumped about. This "hopping" phenomenon has been observed in the case of Bruchid grubs also which infest Peas, Grams, and other pulse-grains and also in the case of some moth larvæ living inside seeds.

The fact that they have been growing less in number of late and less vigorous in action can be easily explained. The larvæ must have changed to pupæ and in due course there is less of activity; and from pupæ adult beetles must have emerged and the empty shells that are left behind are not brought out of the nest.

EDITORS.

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#### No. XVIII.—TROUT FISHING IN CEYLON.

The following extract from the Ceylon Manual for 1900 gives an authentic account of the introduction of trout into the Ceylon streams:—

"The first experiments in trout breeding were made in 1880 by the late Mr. Hugh L. Hubbard of St. Johns, Nda. Pusselawa, who was greatly interested in the subject; and to his efforts is due the knowledge that trout can be easily reared in Ceylon waters. He was assisted by Mr. C. J. R. Le Mesurier and Mr. Hearn, but no record apparently was kept of the number of Ova imported. In 1882 about twenty fish were turned into the Nuwara Eliya stream by Mr. Hubbard. In 1886 and 1888 the public subscribed liberally and an equal amount was contributed by the Local Board making a total of considerably over Rs. 3,000.



Ova were imported in 1886, 87, 88, 89 and 1890, but no record was kept of the results or of the localities where fry were turned out. From 1892 Ova have been regularly imported in considerable numbers and at present two or three importations of about 20,000 Ova on each occasion are made during the first four months of the year. Originally the Ova imported were those of the Brown Trout (*Salmo fario*), but in 1899 Ova of the Rainbow Trout (*S. irridens*) were imported for the first time and, as they stand heat better than the Brown Trout, they have proved very successful."

Subsequently, Mr. George Fowler, of the Ceylon Civil Service, while in office at Nuwara Eliya devoted much attention and care to the Hatchery importing 22,000 Ova at his own expense and it was owing to his zeal in the matter that the "Industry" was put on a sound working basis.

After that the supply was kept up by public subscription to the Trout Fund Committee, which gave place to the Ceylon Fishing Club, founded in 1896. The Club has a lease from Government of all streams above an altitude of 4,000' at a rent of Rs. 100 per annum and all sums collected by stamp duty on licenses, issued under Ordinance No. 8 of 1893, are refunded to the Club. Brown Trout were caught in the Horton Plains water in 1891 of 5 to 6 lbs., and in the Nuwara Eliya lake one of 14 lbs. and another 13½ lbs. were taken in 1904. But it soon became apparent that the Brown Trout did not breed although fish of both sexes had been taken which were in a condition to do so; and this failure is attributed to the fact that the temperature of the water in Ceylon rarely, if ever, falls below 50° Fahr.

With the Rainbow Trout, however, the reverse is the case, and the streams are well stocked with young fish.

Licenses to fish for trout can be obtained from the Secretary of the Club at the following rates for members and non-members:—

				Rs.	Rs.
Whole season	..	..	..	50	120
One month	..	..	..	30	75
One week	..	..	..	15	25
One day	..	..	..	5	12.50

A. H. DUNSMURE.

CEYLON,  
10th May 1918.

#### No. XIX.—VEGETABLE DIET OF COMMON HOUSE LIZARD.

I did not know that the common house lizard was not averse to a vegetarian diet.

Our dog's food is generally put on the top of a book case to cool. Directly the dishes touch the wood, up starts a small lizard's head from behind the book-case, he crawls cautiously forward, and taking short darts as he would for a fly, eats about five grains of rice with much swallowing.

When the dishes are removed he remains near and stares into space; if they were left there perhaps he would make a larger meal, but the dogs are hungry, and he gets slower with every mouthful.

D. SWITHINBANK.

PROME,  
11th April 1920.

The Fat-tailed Lizards (*E. macularius*) living in captivity in the Society's Museum sometimes feed on Biscuit crumbs. (Editors).



## PROCEEDINGS

## OF THE MEETING HELD ON 24TH JUNE 1920.

A meeting of members and their friends took place on Thursday, the 24th June 1920, Mr. John Wallace presided.

The election of the following 41 new members since the last meeting was announced :—Mr. M. Vinayak Rao, Calcutta ; Mr. H. B. Moore, Bombay ; Mr. E. C. Reid, Bombay ; Mr. K. J. Nicholson, Bombay ; Mr. W. H. K. Howard, O.B.E., Bombay ; Major W. B. Trevenen, Poona ; Lt.-Col. H. G. F. Stallard, R.A.M.C., Bombay ; Mr. H. R. Morrison, Assam ; Major L. Mason, M.C., I.F.S., Hoshangabad ; Major L. T. Raikes, D.S.O., R.F.A., Belgaum ; Capt. W. L. C. Brodrick, Bangalore ; Major W. S. Stafferd, Nasik ; Mr. J. Riley O'Brien, Bombay ; Mr. E. H. N. Gill, Allahabad, U.P. ; Mr. G. S. Anderson, Ceylon ; Mrs. W. J. Segar, Dharwar ; Mr. T. Farley, Balipara ; Mr. C. R. Pawsey, I.C.S., Assam ; Mr. H. L. Birley, Assam ; Mr. F. A. C. Munns, Bihar ; Lt.-Col. D. Ogilvy, R.E., Bareilly ; The Mess President, Officers' Mess, Royal Artillery, Lucknow ; Capt. H. R. Irwin, Poona ; Major E. J. Ross, Bombay ; Lt. A. B. MacDonald, R.F.A., Belgaum ; Mr. C. H. Williams, Bangalore ; Wing Commander Charles Bruse, R.A.F., Simla ; Lt.-Col. J. C. Simpson, Lucknow ; H. R. H. Prince Carol, Crown Prince of Roumania, Bucharest ; Lt. A. M. Griffin, I.A.R.O., Bangalore ; Mr. J. B. Knight, Poona ; The Mess Secretary, 1st Kings Shropshire Light Infantry, Crater, Aden ; Mr. H. M. James, Assam ; Mr. Edwin Dean, Peshawar ; Mr. J. L. Henderson, Travancore ; Dr. D. L. Bare, D.D.S., Shillong ; Mr. J. K. Stanford, M.C., M.A., M.B.O.U., I.C.S., Sagaing, Upper Burma ; Mr. E. J. Dunkley, Rangoon ; Mr. R. M. Simmons, Ajmer ; Mrs. G. T. Mawson, Malad ; and Capt. D. G. Brown.

## ADDITIONS TO THE SOCIETY'S MUSEUM.

Contribution.	Locality.	Donor.
<p style="text-align: center;">MAMMALS.</p> <p>1 Rufous Mongoose (<i>M. m. ferrugineus</i>), 1 Desert Pipistrelle Bat (<i>P. mimus glaucillus</i>), 1 Shrew (<i>Crocidura sp.</i>), 16 Desert Gerbilles (<i>M. hurrianæ</i>), 8 Sind Gerbilles (<i>T. sherrini</i>), 5 Hairy-footed Gerbilles (<i>D. gleadowi</i>), 1 Small Indian Gerbille (<i>D. indus</i>), 1 Pale 5 striped Squirrel (<i>F. pennanti argentescens</i>), 2 Persian House Mice (<i>M. bactrianus</i>), 1 Hedge Hog (<i>Paraechinus blanfordi</i>).</p> <p>2 Mottled Pole Cats (<i>Putorius sp.</i>), 1 Leopard (<i>F. pardus</i>), 1 Wolf (<i>C. lupus</i>), 1 Oorial skull (<i>O. vignei</i>), 2 Persian Wild-Goat Skulls (<i>C. aegagrus blythi</i>).</p>	S. Waziristan ..	Capt. C. M. Ingoldby.
	Kurdistan ..	Major E. J. Ross.

Contribution.	Locality.	Donor.
1 Ruddy Mongoose ( <i>M. smithii</i> ), 2 Robertson's squirrel ( <i>F. robertsoni</i> ).	Pachmari, C. P. .	A. E. Osmaston.
Skulls of the following :—3 Panthers ( <i>F. pardus</i> ), 6 Pine Martens ( <i>M. flavigula</i> ), 1 Otter ( <i>L. ellioti</i> ), 2 Mountain Foxes ( <i>Vulpes montana</i> ), 2 Foxes ( <i>Vulpes bengalensis</i> ), 6 Himalayan Tahr. ( <i>H. jemlaicus</i> ), 1 Musk Deer ( <i>M. moschiferus</i> ).	Garhwall ..	
1 Large Indian Civet ( <i>V. zibetha</i> ), 1 Black-backed Squirrel ( <i>S. atrodorsalis</i> ), 1 Grey-headed Squirrel ( <i>S. caniceps</i> ), 1 Tree Shrew ( <i>Tupaia sp.</i> ), 1 Berdmore's Squirrel ( <i>M. bendmorei</i> ).	Siam .. ..	
1 Pigmy Hog ( <i>Sus. sylvanus</i> ), 1 Skull of Pigmy Hog.	Kamrup .. ..	Mr. C. S. Chaston.
1 Tenasserim Giant Squirrel ( <i>Ratufa phaeopepla</i> ).	Tavoy .. ..	Mr. O. C. Ollenbach.
1 Flying Lemur ( <i>G. volans</i> ) ..	Tavoy .. ..	W. S. Wood.
1 Flying Squirrel ( <i>Pet. taylori</i> ), 1 Pigmy Flying Squirrel ( <i>Pt. (H.) belone</i> ).	Sandoway ..	F. C. Purkis.
1 Skull of Persian Gazelle ( <i>G. subgutturosa</i> ).	Banks of the Oxus.	Lieut.-Col. F. M. Bailey.
1 Lion-tailed Monkey ( <i>M. silenus</i> ).	Palaga pandy, India.	A. M. Kinloch.
6 Black Buck ( <i>A. cervicapra</i> ) ..	Dhar .. ..	H. H. The Maharaja of Dhar.
1 Painted-Bat ( <i>K. picta</i> ) .. ..	Shillong ..	W. J. Ballantine.
1 Female Black Buck with horns ( <i>A. cervicapra</i> ).	Amraoti ..	C. J. Griparis.
1 Assam Giant Squirrel ( <i>Ratufa gigantea</i> ), 1 Pallas' Squirrel ( <i>C. erythraeus</i> ).	Garo Hills ..	R. T. Sangma.
2 Common Jungle Cats ( <i>F. chaus</i> ).	Bagobah ..	Major W. D. Ritchie
6 Grizzled Indian Squirrels ( <i>R. dandolæna</i> ).	S. India ..	Mr. R. F. Stoney.
1 Common Jungle Cat ( <i>F. chaus</i> )	Mesopotamia ..	Major E. J. Arthur.
BIRDS.		
2 White-winged Wood Ducks ( <i>S. melanotus</i> ), 1 Great White-bellied Heron ( <i>A. insignis</i> ).	Naga Hills ..	Mr. J. P. Mills.
2 Grey-headed Imperial Pigeon ( <i>Ducula i. griseicapilla</i> ), 1 Malay Bittern ( <i>B. javanica</i> ), 1 Green Shank ( <i>T. glottis</i> ).	Siam .. ..	Major C. H. Stockley.
2 Indian Coursers ( <i>C. coromandelicus</i> ).	Dharwar ..	Mr. L. J. Mountford.

Contribution.	Locality.	Donor.
1 Sheldrake ( <i>T. cornuta</i> ) ..	Fallujah. Euphrates.	Lt. A. Smith.
1 Stiff-tailed Duck ( <i>E. leucocephala</i> ).	Abu Jisra, Mesopotamia.	Major J. Chrystal.
12 Magpies ( <i>Pica rustica</i> ) ..	Shiraz, Persia ..	Lt.-Col. J. E. B. Hotson.
1 Great Slaty Woodpecker ( <i>H. pulverulentus</i> ).	Burma ..	F. Atlay.
BIRDS' EGGS.		
1 Sharp's Spotted Babbler ( <i>P. minus</i> ), 3 Black-breasted Ouzel ( <i>M. protomomelæna</i> ), 3 Silver-eared Mesia ( <i>Mesia argenteauris</i> ), 2 Burmese Button Quail ( <i>T. blanfordi</i> ).	Naga Hills ..	J. P. Mills.
REPTILES.		
<i>Lizards.</i>		
2 Desert Monitors ( <i>V. griseus</i> ) (alive), 1 Common Monitor ( <i>V. bengalensis</i> ) (alive), 5 Spiny-tailed Lizards ( <i>U. hardwickii</i> ) (alive), 1 <i>Gymnodactylus scaber</i> , 1 Persian Gecko ( <i>H. persicus</i> ), 1 <i>Agama rubrigularis</i> , 1 <i>Agama isolepis</i> , 1 <i>Acanthodactylus cantoris</i> , 1 <i>Eremias guttata</i> , 5 <i>Eumeces scutatus</i> .	S. Waziristan ..	Capt. C. M. Ingham.
1 <i>Calotes nigrilabris</i> , 1 <i>C. leolepis</i> ..	Ceylon ..	Lt.-Col. F. Wall.
<i>Snakes.</i>		
3 Jerdon's Blind Snake ( <i>T. jerdoni</i> ), 3 <i>Aspidura brachyorrhos</i> , 1 <i>Haplocercus ceylonensis</i> , 10 Drummond Haye's Shield-tails ( <i>R. drumundhayei</i> ), 1 Singalese Krait ( <i>B. ceylonensis</i> ), 3 <i>Aspidura trachyprocta</i> and 1 Shield-tail <i>Rhinophis</i> sp.	Ceylon ..	J. Erskine.
1 Schneider's Water Snake ( <i>H. enyhydris</i> ).	Gonda ..	F. Field.
1 Cobra ( <i>N. tripudians</i> ) without cuneate scale.	Sehore, C. I. ..	Col. C. E. Luard.
INSECTS.		
<i>Lepidoptera.</i>		
2 Snow Butterflies ( <i>D. apollinus</i> ) ..	Mosul ..	Lt.-Col. C. W. Watney.
157 Butterflies ..	Kuban Valley, N. Chindwin.	Major E. J. Ross.
70 Butterflies ..	Coonor ..	Mr. J. Florence.





Contributions to the Museum as exhibited at a meeting held on the 24th June 1920.



The following contributions have been sent to the British Museum for identification and return :—

Contribution.	Locality.	Donor.
17 Mammal Skins and Skulls ..	Moko-k e h u n g, Naga Hills.	J. P. Mills.
37 Birds .. .. .	Kurdistan ..	Major E. J. Ross.
12 Magpies .. .. .	Shiraz, Persia ..	Col. J. E. B. Hotson.

## EXHIBITS.

Mr. S. H. Prater, acting Curator, exhibited an interesting number of contributions received since the last meeting. These included specimens received from a range of country extending from the banks of the Oxus to the deserts of Central Arabia.

Special attention was drawn to a number of animals obtained by Major E. J. Ross from Central and South Kurdistan; these include a leopard, a wolf, two mottled pole-cats and the heads of the Persian wild goat and Oorial. The two mottled pole-cats are a welcome addition to the Society's collection. They are nocturnal animals living in burrows and feeding on small animals, birds, insects and reptiles. Hutton gives an interesting account of one which he kept in captivity; he says that it killed in succession four wagtails and four rats. It had a special way of dealing with rats, these were always seized behind the ear and held until they stopped struggling and were then despatched with a couple of bites through the skull. The animal would never eat during the day but stored its victims away in the corner of the cage and finished them after night fall. The skin of an ostrich presented by Lt.-Col. A. T. Wilson attracted great attention. It was given to Col. Wilson by the Chief of the Anaizah tribe in Central Arabia. Outside African limits the ostrich is to-day confined to the deserts of Central Arabia and possibly the borders of Palestine. In former times this bird had a very much wider distribution. Evidence of its occurrence in Europe has been found through discovery of a petrified egg in the Cherson district of South Russia. And we read that a "Camel Bird" or ostrich was amongst the presents received by an Emperor of China from a Cham in Turkestan. That it once occurred in India is proved by the finding of a fossil specimen in the pliocene beds of the Siwalik range. This fossil specimen is named "*Struthio asiaticus*", it differs from the modern bird in having a stouter neck, but in other respects closely resembles it. Within recent times ostriches occurred in Mesopotamia and Persia and perhaps in Baluchistan and Sind though evidence as regards the last two countries is rather slender. Not long ago the common way of hunting ostriches in Arabia was to ride them down—an interesting account of this is given by Canon Tristram. At the present day, however, the more prevalent method is that briefly described by Col. G. Leachman, who in a letter just received writes :—

The ostriches are hunted by Sulaib (Sing. Solubbi) a type of nomad, thought to be of non-Arabian origin. They live alone in small camps far out in the



desert throughout the year and have far greater knowledge of water holes than the Bedouins themselves. Their hunters dress in Gazelle skins and can approach within touch of Gazelle and Ostriches before firing their rifles. Their rifles are for the most part of a very old type, the reason being that if they carried modern rifles, the Bedouin would certainly take them away from them. Otherwise the Bedouin do not molest them. Burton in his "Pilgrimage from El Medianah to Meccah" says that there is a belief prevalent throughout Arabia that Ostriches fling stones at their pursuers, he writes that this superstition may have arisen from the "pebbles being flung up by the birds' large feet or it may have been a foolery of fancy." A full account of the Arabian Ostrich will appear in the next number of the Journal.

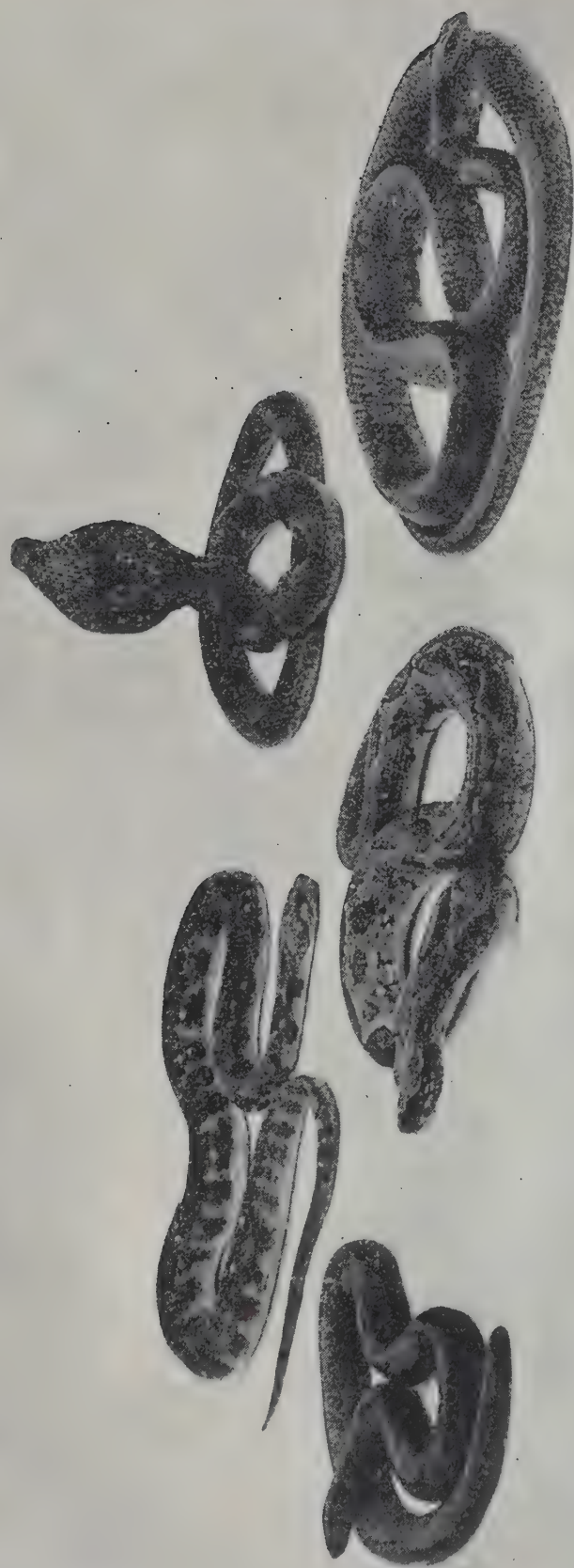
A number of skins were collected for the Society by Mr. J. P. Mills, I.C.S., from Mokokchung in the Naga Hills. The collection contained examples of the Red Serow, Gibbon, Himalayan Monkey, Chinese Scaly Ant-Eater, Porcupine and Bamboo Rats. Specimens of the three kinds of bamboo rats which occur within Indian limits were shown. These were a giant species, a medium sized one and a smaller animal. The bamboo rats are an interesting genus of rodents. They are found in India along the base of the Himalayas in Assam, Burma, Siam and China. They burrow under the roots of large trees using their large teeth and claws for the purpose, or live in the tall rank jungle grass. They are molelike in appearance with thickset bodies, very small eyes and ears and short limbs. Their principal food consists of roots. They are eaten by many of the Burmese and Assamese Hill tribes. The greater part of Mr. Mill's collection is in England where it is being worked out at the British Museum by Mr. Wroughton who has promised to write a report on it for the Journal.

A specimen of a Pigmy Hog was shown. The specimen was obtained by Mr. Chaston on the Bhutan Border. This animal is found at the foot of the Himalayas in Nepal, Bhutan and Sikkim, it measures about 26in. in length and stands 11in. in height. It lives chiefly in the high jungle grass in small herds of from five to twenty. Another remarkable animal shown was the Flying Lemur which was sent in by Mr. A. S. Wood from Tavoy. The Flying Lemur bears the same relation to the Tree Shrews as does the Flying Squirrel to the true squirrel. It has a curious expansion of skin along each side of its body which extends from the throat to the tip of the tail and is used as a kind of parachute in gliding from tree to tree. The animal is purely nocturnal and passes the day by hanging by its legs against the branch or trunk of a tree from which its mottled marking renders it scarcely distinguishable.

A collection of small Mammals and reptiles was obtained for the Society by Capt. C. M. Ingoldby, who had found time to interesting himself on the Society's behalf under the most disadvantageous conditions. Live specimens of the desert monitor and the spiny tailed lizard were presented by him and are shown in the Society's rooms.

A specimen of the beautiful Painted Bat (*K. picta*) was exhibited. Unfortunately these animals lose their wonderful colouring soon after death. But an illustration in the Society's Journal (Vol. XXI, page 1181) shows up remarkably the vivid colouring of this species. The wings are a bright orange and black and the body is buff coloured. This bat occurs all over India and when disturbed by day is often mistaken for a beautiful butterfly. Favourite roosting spots of this creature are the leaves of the plantain tree.

The head of a female black buck with horns was shown. The Society already possessed examples of a horned doe and there were several records of similar heads in the Journal. The present example was presented by Mr. Gripas from Amraoti, Berar.



Painted Plaster Casts of Common Indian Snakes prepared in the Society's Museum























